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SOME RECENT TRENDS IN PIG NUTRITION*

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I have been asked to deal with nutritional topics only, and not with associated problems of management and disease. It is nevertheless virtually impossible to separate questions of correct feeding from those of environment and choice of breed or type for the job. It is also difficult at the present time to concentrate upon the fundamentals of nutrition when the major factors are really the availability of food supplies and the way in which these supplies are allocated to the industry.

For many years important research upon the nutrition of pigs has been carried out in this country and elsewhere. Since the war the effort in the U.S.A. has been intensified, and there have been well over 100 scientific papers from that country alone. An attempt to analyse the whole of recent research, and to discuss its practical implications, would be well beyond the scope of a series of lectures, let alone a single short address, and I shall have to content myself with a selection of what would appear to be the more interesting trends. In the time at my disposal I intend to deal briefly with:—

(*a*) Plane of nutrition.

(*b*) Protein allowance, vitamin requirements and other factors influencing the quality of the ration.

(*c*) Consideration of pasture, swill-feeding, methods of feeding and the new hormonal preparation; and

(*d*) The existence of nutritional defects in the field.

I should like to refer back to the now "classical" experiments upon controlled growth and development in the pig carried out up to the beginning of World War II by Hammond's school at Cambridge, and particularly to those reported on in detail by McMeekan (1940-41). To quote Hammond's own words: "As the pig grows up the general proportions of the body change. At birth the head and legs are relatively large and the body is short and shallow, and as growth occurs the body first lengthens and then deepens. In the young pig the lower part of the leg, consisting mainly of bone, is relatively large, while the muscles of the thigh are poorly developed. As the pig grows up the upper parts of the leg grow faster than the lower, so that the outline of the thigh becomes convex instead of concave. These are just the differences between a bad-shaped ham and a good ham, that is, selection for good hams is selection for rapid and extensive changes in proportional growth. . . . Breeds differ in the rate and extent to which these changes occur. The early maturing pork types, such as the Middle White, pass through these growth changes more quickly and to a further extent than the late maturing bacon types, such as the Large White. The result is that, as a porker at 100 lb. live weight, the Middle White has good hams and is well finished, while the later maturing Large White is still growing in length and has a high proportion of bone. As a baconer at 200 lb. live weight, however, development in the Middle White goes too far and the side is too deep in proportion to its length, and too fat to give bacon of good quality. In other words, the early maturing type has much the same body proportions at 100 lb. live weight as the later maturing type has at 200 lb. . . . Let us now examine in detail how the age changes in body conformation and composition are brought about, and how we can control them. Growth gradients run from the cranium backwards and from the tail forwards and meet in the lumbar vertebrae. Thus after birth the loin makes the most growth, followed by the pelvis and the thorax, then the neck, while the head makes least growth. Growth gradients also exist between the different tissues in any area of the body. Thus in the early stages of life bone makes the most growth, followed by muscle, while the fat attains its maximum rate of growth much later." (Hammond, 1940.)

In the actual experiments, McMeekan controlled the feeding of four groups of pigs, so that they grew as nearly as possible along predetermined growth curves. The rations consisted of a mixture of cereal concentrates—barley meal, flaked maize and middlings—with fish meal. Two of the groups were fed on a high plane of nutrition to start with, being weaned (at eight weeks) at an average of 45 lb., and attaining an average of 100 lb. at 16 weeks of age. At this juncture some were slaughtered for carcase studies. Others were continued on a high plane of nutrition, and were slaughtered at 200 lb. live weight, which they attained at an average of 165 days of age. Others again were changed to a low plane of nutrition, and were 196 days of age before they attained 200 lb. live weight. Thus "High-High" and "High-Low" groups were produced. The other two groups were started on a low plane of nutrition. They averaged only 25 lb. at weaning and only 50 lb. at 16 weeks of age. After selection of some for slaughter the remainder were now split, one group ("Low-Low") being retained on a low plane, so that it did not attain 200 lb. live weight until some 327 days of age, while the other ("Low-High") was transferred to a high plane and attained 200 lb. live weight at the same age (196 days) as the "High-Low" group.

Carcase studies of the animals slaughtered at 16 weeks of age confirmed the necessity of a high plane of nutrition up to that time. The later developing tissues were much more handicapped than the earlier ones, and the proportion of loin to head was profoundly affected. Studies at bacon weight illustrated the permanency of these earlier effects, and confirmed the practical observation that some restriction of feeding after the critical age of 16 weeks is beneficial. To quote Hammond again: "If the pig is well grown in early life the early maturing parts are increased in actual size, and if such an animal is later put on a reduced plane of nutrition, the late developing tissues are slowed down in development, and a carcase with a high proportion of lean and a low proportion of fat is produced. In practice, therefore, limiting the rations of pigs after about 60 to 100 lb.

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live weight is attained gives a leaner and better bacon carcase. (Mansfield & Trehane.) . . . The rate of growth has also an effect on the firmness of the fat. In the young pig the fat is soft, but as the pig grows older the fat becomes firmer, especially if the rate of growth is fast and the fats are synthesised from carbohydrates. On a low plane of nutrition the fat is softer, for then much of the body fat is formed from the food fats. (Callow.) "

An experiment along similar lines has recently been conducted in Minnesota by Professor Winters and his colleagues, who fed four lots of pigs (Poland, China, Duroc and Chester White breeds) from shortly after weaning to market finish at the four levels of intake:—" High-High," " High-Low," " Low-High " and " Low-Low." Thus restricted feeding was introduced somewhat later than in McMeekan's experiments, while no attempt was made to finish the " High-Low " and the " Low-High " pigs on the same day. The ingredients of the rations comprised maize, tankage, soy bean meal and salt and limestone, with ground oats during the first 28 days and lucerne meal during the dry lot period. In these experiments the carcases of the " High-Low " and the " Low-High " animals did not differ materially as in the Cambridge experiments. The " Low-Low " animals required somewhat less food per 100 lb. of live weight gain than the other groups, and when maintenance requirements (taken from Brody, 1945) were taken into account, they required considerably less nutrients per unit of gain: they also produced the leanest carcases. It is therefore concluded by Winters *et al.* (1949) that less nutrients are regarded to produce a pound of lean meat than a pound of fat, and it is suggested that, if their deduction is correct, then selection of breeding stock on the basis of economy of gains " should be at least somewhat effective as a means of selecting animals that will yield a lean carcase."

It is probable that the discrepancy between the two series of experiments is due mainly to the fact that the Minnesota pigs were put on experiment later than the Cambridge ones, and that their high-plane animals were in any event smaller, and probably less well-developed, to start with. As Wallace (1946) has said of lambs: " . . . foetuses that are small as a result of malnutrition of the ewe are not mere miniatures of large ones of the same age; nor are they similar in composition to younger, better-grown ones of the same weight." The same principles apply in contrasting well-done and poorly-done weaners, and therefore the milking capacity of the sow, and the application of creep-feeding are of very considerable importance to all that can be achieved later. Donald (1939), working with the Large White Herd at the Institute of Animal Genetics, Edinburgh, attempted to evaluate the relative importance of sow and litter in determining the variation of the weight of sucking pigs. He employed paired litters farrowed at approximately the same time and divided each into two groups, of which one was left on its own mother and the other transferred two to four days after farrowing to the second sow in exchange for a similar group. The most important factor in the preliminary experiments reported was the environment of the litter as reared, " *i.e.*, either milk production or other sow-conditioned influences of greater significance than any other source of variation." To quote Donald: " Between the ages of three weeks and eight weeks the growth of suckling pigs outruns the available milk supply, which is supplemented by solid food in increasing quantities. The amount of milk consumed at eight weeks of age is nevertheless in the neighbourhood of 40 per cent. of the total food consumption (Olofsson & Larsson, 1930), and it may safely be assumed that the milk production of sows is important at all ages of the suckling pig. Thus variation in the average weight of litters at eight weeks may be readily accounted for by differences in milk production, and although food is only one item in the environment peculiar to each litter as reared, the available evidence suggests that it is the most important item." Another recent paper from Minnesota (Bowland *et al.*, 1949) has indicated that the plane of nutrition affects the composition of the milk of the sow, there being a higher percentage of fat in the early milk of pastured sows compared with that of sows on dry lot. " This was most noticeably evident on the third day when the fat content increased as described by Bowland *et al.* 1949a). This sudden rise in fat content seemed to be caused by the sows converting their body fat into milk fat at a very rapid rate shortly after farrowing. As all these sows, particulary those which had been in dry lot, were fat at the time of farrowing, such an increase might not occur with sows in a thinner condition." The protein content of the pasture-fed sows was correspondingly lower, and actually varied within extremely wide limits (6·4 to 16 per cent.).

On theoretical grounds it is clear from what has already been said that creep-feeding, sensibly practised, is desirable, and I believe that a majority of practical men support it. The benefits or otherwise of creep-feeding are not easy to judge experimentally, but very recently Krider *et al.* (1950) from Illinois have reported upon a series of such trials. When the sows were hand-fed, the advantage to the piglets of creep-feeding was very significant. There was less advantage when the sows were allowed to practise self-feeding with an adequate ration, but in no case was creep-feeding detrimental. Krider *et al.* therefore recommend creep-feeding under most conditions, and particularly under the following:—

(*a*) When sows are hand-fed in groups.

(*b*) When large numbers of sows and litters are running together, increasing hazards to the pigs.

(*c*) When sows are fed limited rations which would prevent the pigs from having access to an adequate supply of supplementary feeds; and

(*d*) When sows are self-fed balanced rations and most uniform rapid and economical performance of the pigs is desired.

They note also that palatability of the creep ration is most important. Food consumption from the creep was greater in their experiments when palatable feeds were offered free choice than when a complete mixed ration was put down.

I think it may be averred that all the experiments to which reference has so far been made have been conducted in such a way that practical deductions may be made from them. There are, however, farm data to support them and one can quote, for example, the pre-war studies of Blissett and Duncan (1938), who showed that, on three commercial farms, pigs weaned at from 40 to 45 lb. gave better live weight increases up to bacon weight than did those weaned at lower weights. Weights of over 45 lb. at weaning did not seem to confer any advantage. It is to be hoped that the series of trials that has been begun by Dr. W. P. Blount and his collaborators at Stoke Mandeville (B.O.C.M., 1950) will provide much more detailed evidence on this point, particularly if the results are analysed to the same degree as those of Smith and Donald (1939). Analysis of the figures in the first National Pig Litter Test there provides interesting data on the relation of weight at ten weeks to subsequent performance, and it was apparently doubted by some observers that in certain

litters the average individual weight at this age was well over 70 lb. I understand that weights at three and eight weeks of selected litters are now to be related to subsequent performance.

From quantity of ration we turn to quality. During recent years the pig has come to be widely used as a laboratory animal in fundamental nutritional studies. Today a very great deal is known of its chemical requirements, and one could cite a long list of vitamins and other growth factors known to be required from exogenous sources by the pig. The translation of this often highly theoretical knowledge into feeding practice is not easy. There is, moreover, the probability that pigs receiving different types of raw materials have different types of bacterial flora in their intestines, and this must modify their nutritional status and their capacity for dealing with other types of raw material. In extreme cases the balance may become so disturbed that illness may result. Thus, in an experiment at Cambridge, pigs receiving a diet of bread alone developed over-large stomachs and some of them died from a well-known organism, *Clostridium welchii*, Type A, that had obviously been allowed to thrive in the alimentary tract. Had I remained at Aberystwyth, it is, I think, probable that work on the organisms normally present in the alimentary tract of the pig would have been carried out with the support of the Agricultural Research Council. Other laboratories are, of course, alive to this problem, and it is to be hoped that it will be tackled on a sufficiently wide scale to enable the effect of different foodstuffs to be studied with precision. It is not unlikely that some of the conflicting reports upon the value of pasture for growing pigs may be linked with intestinal microflora, while breed or strain differences in ability to stand up to swill-feeding or other extensive changes in the nature of the food may likewise be due, in part at least, to adaptability on the part of the populations of organisms in the gut.

The first and most difficult topic is that of protein. There is perhaps greater confusion over " protein requirement " than over any other nutritional concept. Protein is, of course, a generic term for a class of nitrogenous substances of widely differing nutritive value. Whereas certain proteins and combinations of proteins provide all the essential amino-acids and other derivatives necessary for health and optimum performance, others do not. Moreover, there are other nitrogenous substances in many foods besides true proteins. In Great Britain it has been common practice to assess the value of these other substances as half that of true protein, and we employ a term " protein equivalent," and in computing rations add together the percentage of true protein and half the percentage of non-protein nitrogenous substances present. Whatever the merits of this system for ruminants, it can at best be a very crude approximation for pigs. In a war-time experiment that a group of us conducted at Cambridge (Hutchinson *et al.*, 1943) we assessed the nutritive value of " potato protein " for the pig, but in actual fact we worked entirely on the basis of " potato nitrogen." Maynard (1947) concludes that a distinction between crude and true protein of foods seems no longer worth while, and he uses the term " protein " to express the value obtained by multiplying the total nitrogen by 6·25, or some other stated factor. " It should be borne in mind that the value so expressed includes other nitrogen compounds besides protein and that a more exact measure of the value of feed nitrogen for protein nutrition must be at present a biological rather than a chemical one."

Fortunately, such biological data for the pig are accumulating. During the past few years from Cambridge alone there have been published some precise findings on the nutritive value not only of potato nitrogen, but also that of barley, maize and food yeast (Macrae *et al.*, 1942; Hutchinson *et al.*, 1943). When weaning pigs received maize meal as the sole source of protein they grew poorly, despite the addition of vitamins and minerals, and showed an average increase of only 20 lb. during the 16 weeks of the experiment. With the addition of 5 per cent. of pure dried yeast (*Torula utilis*, grown in a molasses medium) to the maize meal, growth of comparable weaners was good, and they attained a live weight of 190 lb. in 16 weeks. The capacity of the proteins in yeast to supplement the proteins of maize was of the same order as that of casein. This is an interesting practical point when one considers alternatives to skim milk for pig feeding. Barley nitrogen also requires supplementation with casein or other " first-class " protein to give optimum conversion of food into live weight gain. It is, however, consistently superior to potato nitrogen for the fattening pig.

In view of these wide differences between the value of the proteins of different foods, it is not practicable to lay down minimum or optimum levels of protein in the ration unless one has a fairly precise idea of the foods concerned and of the biological value of their proteins. A level of 5, 10 or more per cent. of protein will have a very different meaning according to the foods from which it is made up. It is perhaps necessary to make clear one somewhat elementary point. Some authors refer to protein percentage, calculating the total protein made up from cereal as well as other ingredients in the ration. Others ignore cereals for this purpose and talk of the percentage of protein supplement, *e.g.*, fish meal. Thus at the 1939 meeting of the American Society of Animal Production (see Fairbanks & Curzon, 1941) two workers reported that for pigs weighing 40 to 70 lb., diets containing as much as 22 to 27 per cent. of protein produced more economical gains than did diets containing less protein. Another group of workers suggested 18 to 20 per cent. of protein at 50 to 75 lb. live weight, 15 per cent. protein at 75 to 150 lb., and 12 per cent. protein above 150 lb. In their well-known work in this country on protein levels for bacon pigs, Woodman and his colleagues (Woodman, Evans & Callow, 1936; Woodman, Evans & Turpitt, 1937; Woodman, Evans, Turpitt & Callow, 1939; Woodman & Evans, 1940, 1941) referred to the percentage of fish meal or other protein concentrate added. From the practical pig-feeder's point of view, especially in these days of food scarcities, the latter method has much to commend it. It is indeed interesting that Woodman and Evans (1941) reported that: " It has been shown that a diet supplying, in addition to barley meal, weatings and 2 per cent. of lucerne meal, 5 per cent. of fish meal up to 90 lb. live weight, 2 per cent. from 90 to 150 lb. and no protein-rich food from 150 lb. to slaughter at 200 lb. live weight, will give almost as good results, from the stand-points of mean daily live weight increase and efficiency of food conversion *over the whole period* as one that provides 10 per cent. of fish meal from weaning to 150 lb. and 5 per cent. of a protein-rich food such as extracted soya bean meal from 150 to 200 lb. live weight." They admit that the provision of only 5 per cent. of fish meal or less up to 90 lb. live weight retards the rate of growth, but state that this initial setback tends to be wiped out during the later stages of feeding. This suggestion of recovery is not altogether in keeping with other work already cited, and it is gratifying that in their actual recommendations Woodman and Evans suggest the incorpo-

ration of 7 per cent. of white fish meal (or its equivalent of other protein food) in a diet otherwise made up of cereals and weatings with a little green food, for the period from weaning to 90 lb. live weight, dispensing with the protein supplement thereafter.

The protein supplement recommended for pigs is usually of an animal nature, and this leads to a consideration of " animal protein factor " or A.P.F. It was mainly studies with chicks that indicated the deficiencies of all-vegetable protein in the ration. It became evident that the differences between animal and vegetable proteins were not to be explained solely on the basis of amino-acid make up, important though this is. It seemed as if some vitamin-like factor was concerned, and in 1946 Rubin and Bird at Beltsville prepared an active concentrate of this factor, now termed A.P.F., from cow manure, they and others having shown it to be present also in liver, fish solubles, fish viscera and dried rumen contents. In the same year, Rubin *et al.* (1946) identified A.P.F. in hen droppings, and in 1947 McGinnis *et al.* at Washington State College showed that A.P.F. was formed in the faeces *after* they had been voided by the action of a live micro-organism. In the next year there was the simultaneous announcement in Great Britain and America of the isolation of vitamin B_{12}, a red crystalline compound containing cobalt and phosphorus as well as protein or protein derivative. This vitamin is of principal interest in that it is highly active in the treatment of pernicious anaemia in man, but it has also been shown to be a growth factor for pigs and poultry, and to be one of the components of A.P.F. The identification of the other components is not yet completed, but the organism used to produce aureomycin, *Streptococcus aureofaciens*, is a good producer of the complex. In the U.S.A., therefore, the same unit is being used for the production of a powerful antibiotic for human and veterinary use, and of A.P.F. for livestock feeding.

Vitamin B_{12} and the other components of A.P.F. have been shown to be required by pigs. Recently Groschke *et al.* (1950) at Michigan State College have demonstrated A.P.F. activity in incubated but not in freshly voided pig manure, a finding that provides further evidence of the value of coprophagy to an animal that is not otherwise receiving its full complement of dietary essentials in the usual way. It is interesting to compare the emergency practice of coprophagy in animals like the pig with its regular employment by the rabbit, and to contrast this type of utilisation of microbial synthesis of essential dietary factors with that developed to a high degree in ruminant animals. It is, however, important to realise that in simple-stomached animals, such as the pig and ourselves, a certain degree of bacterial action can and does take place normally within the alimentary tract, as indicated earlier.

A number of American workers have reported upon the value of A.P.F. for weanling and fattening pigs (Catron & Culbertson, 1949; Catron & Wallace, 1949; Cunha *et al.*, 1949; Burnside *et al.*, 1949; Anderson & Hogan, 1949; Hale & Lyman, 1949; Lepley *et al.*, 1949; Luecke *et al.*, 1949; Colby & Ensminger, 1950). The vitamin B_{12} requirements of the baby pig have been studied (Johnson & Nesheim, 1949; Neumann *et al.*, 1950), and so have those of sows during gestation and lactation (Heidebrecht *et al.*, 1949; Vohs *et al.*, 1949). There seems little doubt that on diets of which the protein is all-vegetable in character, the addition of A.P.F. is of very significant value and that vitamin B_{12} is an essential metabolite for the pig and necessary for normal haemopoiesis. The paper of Catron and Wallace (1949) is of interest in that the trial was conducted under farm conditions. In their most recent paper Cunha and his associates employed a basal ration of maize and groundnut meal, supplemented with minerals and vitamins, the amount of groundnut meal being adjusted so that the final protein content varied from 12·2 to 19·6. Pigs fed a 12·2 per cent. protein ration plus A.P.F. gained as rapidly as pigs fed a 19·6 protein ration without A.P.F. supplement. Those fed a 15·9 or a 17·9 per cent. protein ration plus A.P.F. gained faster than those receiving the 19·6 per cent. protein ration without A.P.F. With A.P.F. added in both cases, the rates of gain on 17·9 and 19·6 per cent. protein rations were the same, indicating that with A.P.F. the optimum level of protein is only about 18 per cent. It would appear that the efficient utilisation of protein depends upon the presence of A.P.F.

It was reported by Bird *et al.* in 1946 from Beltsville that chicks hatched from the eggs laid by hens receiving rations in which all the protein was vegetable showed kidney damage and low viability. Schultz and Halvorson (1949) in Minnesota have now described an acute uraemia in rats born to mothers receiving diets devoid of animal protein. It would appear that in the newly hatched chick or newborn mammal, A.P.F. is necessary to maintain kidney function.

During recent years, considerable attention has been paid to fish solubles as a protein supplement for pigs. "Fish solubles " is produced by condensing the water and body fluids resulting from the hydraulic extraction of oil from fish. Another protein supplement that has been employed in the U.S.A., " liquid fish," is " the processed combination of both presscake and presswater obtained after whole fish and/or fish trimmings are cooked and pressed to remove the oil " (Guerin *et al.*, 1950). The addition of 2 per cent. fish solubles to ration of maize, soy bean oil, sun-cured lucerne meal and minerals was found by the Purdue workers to give a very marked growth response. Similar but smaller responses were given by 1 per cent. fish solubles or 2 per cent. liquid fish.

Attention is now being paid to the amino-acid requirements of the pig. It is probable that these are similar to those of the rat, dog and man, but precise information for the pig is to be welcomed. From Purdue, Mertz *et al.* (1949) have shown that lysine is indispensable for the weanling pig, a lack of it resulting in cessation of growth, retarded food consumption, and decreased food utilisation. The symptoms include depraved appetite, rough coat, and an emaciated appearance. Maize, which is stated to constitute some 60 per cent. of all pig rations in the U.S.A., and other cereals are generally low in lysine. The addition of animal protein, which contain large amounts of lysine, is therefore further justified. The same workers (Beeson *et al.*, 1949) have demonstrated that tryptophane also is essential for the growing pig, and that lack of it causes decreases in food consumption and the efficiency of food utilisation. Maize is low in tryptophane. It had already been shown with growing pigs (Luecke *et al.*, 1947; Powick *et al.*, 1948) that there was a relationship between tryptophane and nicotinic acid. When a diet largely comprising maize is fed, nicotinic acid deficiency results (Chick *et al.*, 1938). This can be prevented by feeding high levels of casein (Wintrobe *et al.*, 1945) or cured with tryptophane as well as with nicotinic acid (Luecke *et al.*, 1947). Powick *et al.* (1948) concluded that nicotinic acid did not appear to be completely effective as a substitute for tryptophane, but that tryptophane appeared, in large measure at least, a substitute for nicotinic acid. The inference is that tryptophane acts as the precursor of nicotinic acid in the animal body.

Time does not permit of a detailed review of the vitamin

requirements of the pig, but the list of essential vitamins would probably now include A, D, E, K, B_1 (thiamin or aneurin), riboflavine, nicotinic acid, B_6 (pyridoxin or adermin), pantothenic acid, choline, biotin, pteroylglutamic acid, and B_{12}. In some cases these vitamins are synthesised to a greater or lesser degree by the pig itself, and here again a study of the intestinal microflora is called for. Nicotinic acid has already been mentioned, and there are some further facts of practical importance. Quite apart from the presence or otherwise of tryptophane in the diet, nicotinic acid deficiency may not develop if the pigs can lick moulds and yeasts from the floors or walls of their pen (Hughes, 1943), which contain this and other B vitamins. Spontaneous recovery from nicotinic acid deficiency takes place with age (Smith *et al.*, 1941; Worden & Slavin, 1944), and indeed deficiency is much more likely in the critical period up to 16 weeks of age. Conditions simulating nicotinic acid deficiency have been reported from the field, and pathologically it is almost impossible to distinguish the lesions from those of necrotic enteritis, which in this country is usually, but not invariably, associated with *Salmonella suipestifer* infection. Blakemore (see Worden, 1947) found that in East Anglia treatment of field cases of necrotic enteritis with nicotinic acid gave an apparent initial response that was not sustained. There have been several attempts at Weybridge and at various American centres to unravel the connection between vitamin deficiency, infection and the occurrence of enteritis, and very recently Thorpe *et al.* (1949) report that they have made a detailed study of 80 cases of nutritional enteritis obtained from eleven different farms in Michigan. The rations were low in protein and made up largely of cereal grains, and the results of daily urinary excretions indicated that the animals were deficient in pantothenic acid and possibly riboflavine as well as in nicotinic acid. Similar studies on animals in this country remain to be made, but in view of the age at which necrotic enteritis and apparently similar conditions occur over here (see Slavin, 1942; Worden, 1942), attention to the vitamin B complex content of the rations of pigs during the period before and after weaning would appear to be justified. For practical purposes yeast is an excellent source of most of the B vitamins, and the inclusion of even up to 10 per cent. of dried brewers' yeast or food yeast (when the latter is available) is highly beneficial. During the later stages of fattening the percentage of up to 5 is advantageous. Care must be taken to ensure that there is sufficient calcium and vitamin D in the ration to offset any possible dangers from the rachitogenic factor in yeast (Braude *et al.*, 1943; Worden, 1943). Although yeast protein suffices in its power to supplement maize protein in the experiments of Macrae *et al.* (1942), to which reference has already been made, it is probably not adequate as a source of, or substitute for, A.P.F. In recent experiments reported by Braude (1949) from Shinfield, yeast extract did not replace liver extract which, when fed in conjunction with an iron supplement, improved growth in baby pigs. It is interesting that Braude's findings tend to confirm those of Dedichen (1949) in Norway, who recorded that pigs' livers collected during the winter months were almost devoid of anti-pernicious anaemia factor (*i.e.*, vitamin B_{12}), whereas those collected during the summer months from pigs maintained out of doors had a high activity. Braude found out that during the winter his experimental piglets responded well to liver supplement, whereas during the summer his piglets kept out of doors did not respond at all.

Tryptophane and nicotinic acid do not form the only example of inter-relationship between an amino-acid and a vitamin. Nesheim *et al.* (1949) from Illinois have recently shown that if sufficient methionine (1·6 per cent.) is included in the ration, baby pigs can dispense with dietary choline. Another recent vitamin study from Illinois (Mitchell *et al.*, 1949) has shown that, at high environmental temperatures, the riboflavin requirement of growing pigs is lessened. At 85° F. 1·2 mg. of riboflavin per kg. of food was adequate, whereas at 42° F., 1·8 mg. per kg. was apparently insufficient.

The necessity of supplementing practical pig rations with vitamin A and D has been recognised for many years, but there is still room for improvement in the method of addition. The indiscriminate use of cod-liver oil is not free from dangers, while its vitamin content is very rapidly destroyed in mixed rations in the absence of stabilising agents. There would appear to be practical justification for the method devised before the war at Shinfield by Foot *et al.* (1938), who showed that by massive dosage of the weaner pig with 400,000 to 500,000 I.U. of vitamin A they could protect it for the whole of the fattening period and thereafter ignoring the vitamin A content of the ration. The method involves no more work than the routine dosing against internal parasites. " It should be especially attractive to the farmer using intensive methods of rearing." Parenteral injection of a concentrate containing not only vitamin A but also vitamin D would appear to be even simpler and more satisfactory. While the aetiology of " stiffness " or " cripples " in fattening pigs is not completely understood it is, sometimes at least, associated with a low level of serum calcium (Sinclair & McElroy, 1934), and from work on other species a massive protective dose of vitamin D, plus the provision of sufficient calcium in the ration, would appear to be a satisfactory means of prevention against this.

Any discussion of minerals must likewise be curtailed. Manganese, which is present in extremely low amounts in maize and maize products, has recently been shown to be essential for optimum growth, reproduction and lactation in the pig (Grummer *et al.*, 1950). Some exact studies are now being made (see Meyer *et al.*, 1949) upon the sodium and chlorine requirements of pigs. " Salt poisoning " is a difficult and vexed question (Worden, 1941), but there have been reports that utilisation of food is more efficient when the salt content of the ration is increased beyond the amounts normally fed (see Sinclair, 1939, who was unable to substantiate them), and the Wisconsin experiments should clarify this point.

Taking all the above and much more evidence into account, we may conclude that there is ample justification for varying the practical rations of pigs in a definite way. The pregnant and lactating sow, and the young pig up to about 14 or 16 weeks of age, should receive a high plane of nutrition and a diet that is amply supplemented with sources of the essential growth factors and with animal protein. From this age onwards in animals that are being fattened, restriction of the diet is justified and provision of animal protein and certain of the supplements at least is probably uneconomic. We could profitably follow Krider (1949), who states that " Research indicates necessity of manufacturing tailored swine feeds for specific jobs," and who considers " gestation-lactation " and " growth up to about 75 lb. in weight in drylot " as the nutritionally critical periods in the life of the pig, for which specific rations should be devised. We must be careful, however, not to neglect the effect of ration upon the firmness of the fat during the non-critical later stages of fattening. Reference has already been made to the observations in this connection of Callow (1935).

We may conclude with a few notes upon practical feeding and upon the other topics indicated in the introduction. In the U.S.A. the use of self-feeding has been appreciated for many years. Here its introduction on a serious scale was not made until the National Pig Litter Tests at Stoke Mandeville began last year. There was much sceptism concerning the value of the self-feeding drymeal system, but the results so far have confirmed American experience and demonstrated that it is efficient and practical, and by no means wasteful. It is to be hoped that its use over here will spread. To quote the B.O.C.M. (1950) Report: " There is very little waste feed indeed, and the majority of the pigs settle down quickly to a healthy appetite and over-eating is not common. What is more important is that self-feeding provides a standardised system of feeding giving all pigs equal opportunities of growing to the full capacity of their genetic make-up." There are, however, obvious practical difficulties in adapting or combining such a system with restriction during the later stages of fattening, unless pigs are moved to new surroundings at the end of the critical period.

Our present knowledge in this country of the value of pasture and pasture derivatives has been well and clearly reviewed by Davidson (1948, pp. 212 to 215) in his valuable text-book. There can be no doubt of the value of pasture for breeding stock, but assessment of the nutritive value of grass and clover as such for fattening pigs has not been reached. The quite discrepant results of different groups of workers implies that unknown variable factors were at work. The value of a pasture run-off was obviously influenced by weather conditions and soiling in Wallace's (1943) experiments at Cambridge. The results of Wallace's second trial, from July to December, are aptly summarised by Davidson as follows: " The second trial . . . indicated that grazing pigs sometimes saved meal and sometimes wasted it, and that those that were out for the whole period finished by being in debt to the pasture. Results obtained with grazing sheep at Cockle Park in Northumberland show the same kind of situation." The value of different types of pasture for fattening pigs is being much more extensively studied in the U.S.A. (see, *e.g.*, Gobble *et al.*, 1949), and it may be suggested that similar trials over here will be necessary before more definite pronouncements are possible. Even so, it must be realised that, to quote an earlier lecture (Worden, 1949) ". . . access to pasture must of necessity create its new problems as well as help to solve certain others. This is clearly true of poultry, and although there may not be a great deal of scientific evidence in the case of the pig, it is obvious that the metabolism and parasite relationships of pigs at pasture are different from those of housed or yarded animals."

Swill-feeding has been amply covered in discussions previously sponsored by this organisation (Blount, 1949; Worden, 1949) and the only point that I would make here is that, if it is to be encouraged as a practical measure in Great Britain, the fundamental nutritional points already reviewed should not be completely disregarded. Swill is essentially a food for the non-critical period of fattening, and it was by limiting it so far as possible to this that the war-time project at Paddington (Lovatt *et al.*, 1943) was such a success. Even so, the quality of the carcase fat was disappointing, and it would be difficult to frame constructive proposals for overcoming this defect.

The possibility of improving the efficiency of food utilisation and the rate of fattening by administration of substances calculated to affect the thyroid gland have been under investigation for some years. In their review of the position Blaxter *et al.* (1949) concluded: " Although practical recommendations are hardly warranted at this time, the modification of thyroid function shows considerable promise for application in swine husbandry. Its proper use, however, will require intelligent consideration of the principles of thyroid physiology involved. Iodinated protein will be effective in stimulating growth only if given during the early growth stages when the requirement for thyroid hormone relative to bodyweight is at a maximum (Reinecke, McMillen & Bratzler, 1948; Hurst & Turner, 1948) and at dosages within the range of physiological tolerance. Thiouracil, on the other hand, will stop growth early by blocking out the needed hormone function if given at too early an age. If given during the last four to six weeks of the fattening period, however, it will usually result in a substantial improvement in economy of gain. Considerable research is still needed with both drugs to determine the possible modifying effects on the response of such factors as breed and strain of pigs, nutritional adequacy of the ration, season of the year and general environmental conditions." There have been a number of original publications since, including those of Braude and Cotchin (1949) from Shinfield and the Royal Veterinary College, but they do not suggest that the practical introduction of these measures can be contemplated for the time being. Moreover, it would seen obvious that the indiscriminate use of such products must never be permitted. Should they become commercially available they will have to be restricted to the specialist pig-farmer and preferably introduced under skilled supervision.

Nutritional enteritis, and " stiffness " or " cripples " have already been mentioned. There are also piglet anaemia and a number of other nutritional disorders of common occurrence in the field. There are some associated environmental factors (*e.g.*, warmth in the case of piglet anaemia, hygiene in the case of nutritional enteritis) to be borne in mind, but by and large these diseases are really to be considered not so much as entities, but as endpoints to the inefficient provision of balanced dietaries at critical periods. Application of the principles already discussed, and care in the transference of animals from one type of foodstuff to another, particularly through the weaning period, will largely overcome them.

Summary and Recommendations

(1) A high plane of nutrition, adequate amounts of animal protein, and satisfactory provision of the B vitamins and other essential metabolites should be ensured during pregnancy and lactation and in the young pig through weaning to about 14 to 16 weeks of age. The effects of weaning can be countered by suitable creep-feeding and by attention to factors that may become in short supply during the critical weeks that follow.

(2) From about 14 to 16 weeks of age until bacon weight, leaner and better types of carcase, and more economical utilisation of food, result from restricted rations. Care must be taken, however, that impaired growth or unsuitable food during this period does not lead to unsatisfactory fat.

(3) The precise nutritional requirements of the pig are fast becoming known, and with suitable applied trials in this country it should be possible to define the need for vitamin and other supplements in terms of the basic foodstuffs available. Under American conditions, the replacement of animal protein by "A.P.F." and, probably, other supplements, is becoming a practical reality for fattening pigs.

(4) The National Pig Litter Tests that are being conducted at Stoke Mandeville are providing many useful data on the relationship of initial weight to subsequent food

utilisation and carcase quality. They are also demonstrating the practical and labour-saving advantages (at least during the unrestricted feeding period) of the self-feeding drymeal system.

(5) There is little doubt as to the value of pasture for breeding stock, but much more careful work is needed to assess the relative food value of grass and other pasture constituents for fattening pigs in this country.

(6) Swill-feeding is not ideal, but much more economic utilisation of swill could be made by strict observance of certain fundamental points, as was demonstrated in the Paddington experiments.

(7) More efficient utilisation of food during the fattening period may be effected through the administration of certain products that modify thyroid function. Experiments to date suggest, however, that such practices should be made available only to the specialist.

(8) Nutritional diseases exist in the field and could largely be overcome by application of the principles indicated in (1) above.

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THE CURRENT OUTBREAK OF SWINE FEVER*

BY

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I must first of all disclaim any special knowledge concerning swine fever and I realise that there are many here to-day with vast experience of the disease.

It is, however, a disease with which most of us had no contact during the war years. The policy of withdrawal of essential foodstuffs in the early days of the war, with its resultant decimation of the pig population, automatically reduced the incidence of diseases in the pig and in particular that of swine fever. Indeed, so rare had its incidence become that the restrictions attending the movement of pigs from markets were lifted altogether in the summer of this year, only to be reimposed after a very brief interval.

The renewal of outbreaks has, in my view, shown up the disease in a new light and my few remarks are directed towards drawing attention to this aspect.

Most of us will be familiar with the symptoms and *post-mortem* lesions of pre-war days, when the text-book descriptions could be applied so aptly. It is true that sometimes one encountered the rather rare peracute outbreaks and at other times those of a slow progressive nature. Usually, however, the history and clinical symptoms were of the classical type and the *post-mortem* appearances of a definite diagnostic value.

The first outbreak I have encountered for some years was in the early part of August this year and, as you will be well aware, there have been many such in the West Riding and in other parts of the country since then. In my limited scope as an L.V.I. I soon sensed a variation in the clinical appearances of affected pigs and the *post-mortem* lesions found.

1. There was obviously a slow spread of infection from pen to pen and apparently a long period of incubation of an increased resistance in the larger and older pigs.

2. Ailing pigs did not at first suggest a specific infection. While having a variable appetite they did not appear to lose bodily condition rapidly. They were alert when roused. Later when obviously ailing the temperature was high and some might show diarrhoea. Diffused skin discoloration was not usual and death was often delayed.

3. *Post-mortem* lesions proved often to be atypical and non-diagnostic in character until several deaths had occurred. The slaughtering of pigs for diagnostic purposes afforded very little help and it appeared to be a more useful procedure to allow the disease to run its course to fatal termination.

The lesions encountered were those of a variable gastro-enteritis of varying intensity and the presence of bowel ulceration was rare and, when found, seldom multiple. The most suggestive lesions—when found—were those of ecchymoses in the skin, petechiaeal haemorrhages of the kidneys and submucous haemorrhages in portions of the large bowel. These haemorrhages were by no means constant or necessarily well marked. Thickening of areas of inflamed bowel wall, the so-called " velvet gut," was a very suggestive lesion. The presence of transverse streaks of an intense red on portions of bowel wall appeared to be of significance in assessing the probability of swine fever when taken in conjunction with other findings.

In two outbreaks in very small store pigs, a superimposed paratyphoid infection added its complications.

4. In two outbreaks the apparent immunity of a lot of strong store pigs in each case was most interesting.

5. All outbreaks that I dealt with were of market origin, indicating the necessity for the continuance of restrictions of movement, however irksome they may be.

6. I submit that this present outbreak of swine fever is of a low-grade infection as borne out by a succession of cases showing very similar features with no reversion to the familiar and usual type. Is this another virus infection that is undergoing change?

NOTES ON VARIOUS CASES WHICH I HAVE ENCOUNTERED

CASE 1.—Approximately 280 pigs, large stores and fattening pigs, on the premises. The incubation period was not known, for frequent introductions to the premises took place before movement was restricted. The ailing pigs were distributed in different parts of the same block of buildings. Symptoms were quite indefinite until the later stages of illness, when diarrhoea and high temperature were found. No diagnostic lesions were found until several deaths had occurred.

CASE 2.—Five large store pigs bought August 4th, five weeks before the first death. The pigs were severely ill, but deaths were delayed. Ecchymoses of skin and kidneys were seen and finally a single caecal ulcer was found.

CASE 3.—One hundred and twenty pigs on the premises. The fattening pigs remained healthy all the time until slaughter. Slow deaths were experienced in a batch of 44 recently purchased pigs, the first death taking place a week after arrival. No acute symptoms were ever seen and ten *post-mortem* examinations were carried out before bowel thickening and the transverse inflamed streak mentioned above were found. One lot of thriving stores in the middle of the infected pigs remained healthy throughout the outbreak.

CASE 4.—Five large stores bought September 8th. They remained healthy. The remaining pigs became affected clinically and the first death was on October 5th. Only petechiae of kidneys and bowel were noted.

CASES 5 AND 6.—Small store pigs, recently weaned, which also were affected with paratyphoid. The *post-mortem* examination showed the transverse inflamed streak and bowel thickening. Later superficial ulceration was seen.

CASE 7. (Reported from the abattoir.)—Five pigs with varying degrees of ecchymosis of skin and kidneys. One pig had necrotic areas on the skin around the fetlocks. Investigation on the farm from which they had come showed that all the pigs were clinically healthy, but enquiry elicited the information that the owner was sending in as casualties any pigs which missed two successive meals. It appears

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[*Note added in proof, January* 31*st*, 1951: Since the above lecture was prepared there have been many further publications of importance from the U.S.A., especially in connection with "A.P.F." It is now established that the antibiotic, aureomycin, is a growth factor for pigs, and its presence in certain A.P.F. concentrates accounts, in part at least, for the superiority of these over pure vitamin B_{12}. Work at Shinfield has shown that penicillin also is a growth factor for chicks, but evidence in respect of this and other antibiotics as growth factors for pigs is at present inconclusive. These effects of the antibiotics are obtained when they are administered by mouth, but not when they are injected. From very recent work it appears that still some other factor, besides vitamin B_{12} and aureomycin, is responsible for the activity of A.P.F. concentrates.]

that the owner has controlled the infection by removing the clinical cases.

All cases are those of market infection and the incubation period has varied from ten days to five and a half weeks. In cases occurring before restrictions were reimposed the pigs may have been exposed for sale in more than one market in a very short period of time.

DISCUSSION

The President (Mr. E. Varley), in throwing the paper open to discussion, said that while he had not had recent personal experience of swine fever he would still be most interested to hear what the members had to say.

Mr. P. L. Shanks (Leeds) said that the V.I.O. laboratory had been concerned in five cases which had all been confirmed. A consistent feature of all the cases and one which was very rarely mentioned in print, was the swaying of the hind quarters noticed when affected pigs were made to move. The only likely condition giving a similar appearance was that of oedema of the bowel and this, of course, was rapidly fatal. In swine fever this swaying lasted a number of days. The number of pigs showing skin lesions had been quite high.

Mr. E. Lowes (Wakefield) understood that 70 cases had now been confirmed in the West Riding and there were many others not confirmed. Virtually all his cases had swayed behind and he felt that it was a definite symptom. Haemorrhages of various kinds had prevailed at his *post-mortem* examinations and the transverse striation mentioned by Mr. McKinna had been seen in several cases. He also had noted a slow death-rate in in-contact pigs, in spite of the fact that some of them had been very ill. The incubation period had averaged ten days. While the text-books regarded caecal ulceration as typical, in nine out of every ten cases he had obtained, the ulcers in the large intestine and the caeca had been clear.

Mr. Procter (York) regarded his present cases as substantially the same as those of pre-war days, but there had been some change in the symptoms observed. The same position *re* diagnosis certainly persisted when clinically certain cases had to depend for confirmation on a distant laboratory. He had seen a case where apparent recoveries later had developed into typical cases and the transverse striae had also been found. Recently he had found both diphtheresis of the mucous membrane and swine fever ulcers occurring in the same animal, which was unusual. On another farm very old ulcers—probably seven or eight weeks old—had been found, and during the time they must have been developing a boar had been moved to a different farm, yet he had not carried infection.

Mr. H. B. Allan (Harrogate) agreed with Mr. McKinna that there had been a change in the appearance of the disease and suggested that possibly this was associated with the fact that pre-war our infection was mainly of American origin, whereas now it might possibly be of European strains. He was of the opinion that 70 outbreaks in the West Riding was an extremely low figure, considering the incredible movements of pigs which had been traced, from one market to another, over a period of days.

Miss Dalby (Menston) reported that she had used crystal violet vaccine on eight small stores and 14 days later the first pig had died and the existence of swine fever had now been confirmed. It was possible that the disease had been mixed with paratyphoid infection.

Mr. A. S. Harris (Barnard Castle) was thankful that his area had been free so far. He thought that the swaying of the hind end, coupled with scour, was diagnostic in large pigs; in the small pigs pneumonia was common. He was glad Mr. Shanks had drawn attention to the swaying symptom, which was not a new one but which was always omitted from text-books with the exception of the N.V.M.A. booklet on pig diseases which was associated with Mr. Shanks.

Mr. McKinna, in replying, was pleased to have confirmation of his suggestion that the disease had altered somewhat and he was interested to learn it might be connected with a different source of virus. He was also pleased that others had noted the transverse lesion in the lining of the bowel. No doubt time would tell whether it was in fact a new type of virus or whether the virus was mutating.

Weekly Wisdom

The great antidote to war is hope; its greatest promoter is despair.
—Commonwealth Prime Ministers' declaration.

THE VETERINARY RECORD
February 10, 1951

NEWCASTLE DISEASE

WIDESPREAD outbreaks of the "mild" or "American" type of Newcastle disease which have occurred recently set a new and serious problem to the poultry industry, to the officials of the Animal Health Branch of the Ministry and to the veterinary profession in general.

The slaughter policy has been, and still is, reasonably successful in dealing with outbreaks due to the more virulent "Asiatic" type of virus. The symptoms (or effects) in such cases are too serious to be overlooked by the poultry keeper, and reporting is, consequently, usually prompt.

In outbreaks of the "mild" type, the condition appears to be more highly infectious than in the "Asiatic" type, even among adults, in which the initial symptoms may be so slight as easily to be confused with those of the common "cold." Consequently there has been an understandable failure to recognise the disease, delay or failure to report an outbreak, and a threat to continuance of the slaughter policy.

It may well be asked, why is it necessary to slaughter if the disease is mild and not unlike the common cold? The answer is that although mild and causing little or no mortality in adults, it may cause severe mortality in young birds, it is a menace to the hatchery industry, and, in addition, when laying stock is affected a catastrophic fall in egg output occurs. Moreover, by no means all the outbreaks now occurring are of the mild type and, in many cases, the mortality rate is severe, while apparently the mild form is capable of giving rise to outbreaks of the acute type.

The outbreak which commenced in February, 1947, originated in swill containing offal from imported carcases from Europe. It is not known with certainty whether the present extension of the epidemic has originated from the same source, but in many flocks the disease has all the features of the type which occurs in America.

Diagnosis is difficult. The initial symptoms, as already stated, are those of a cold, but suspicion should be aroused when these symptoms are quickly followed by the finding of eggs being laid on the dropping boards and floors instead of the nest boxes, and almost simultaneously by a very precipitous fall in output. Few deaths occur in adult stock and the *post-mortem* findings are not distinctive. Laboratory diagnosis is by the haemagglutination-inhibition test, which depends upon the demonstration of antibodies to the virus in the blood serum. A positive result is, therefore, less likely to be obtained in the early stages of the disease, the best reactions being obtained from convalescent or recently recovered birds. The virus has been demonstrated in eggs laid while the disease was active in a flock, but it appears to be doubtful whether it is present in eggs laid after recovery.

At the moment every effort is being made to eradicate the infection by energetic application of the slaughter policy. Any prospect of success in this effort depends upon the willing co-operation by all branches of the poultry industry and the outcome is, at the best, still uncertain. Should it fail it may become necessary to resort to the use of vaccine, with the possible permanent establishment of the disease in this country.

Vaccines of various types have been developed and in most countries where vaccination has been adopted a living

vaccine has been used. These living vaccines all consist of strains of virus of low virulence. The first of these was developed by Dobson and Iyer at Weybridge, attenuation being obtained by serial passage on chick embryos. These living virus vaccines have been used widely in India, Palestine and Egypt and their use is extending in the U.S.A. A drawback to them is the frequent occurrence of severe reactions, marked reduction in egg yield and some mortality. There is also always the possibility that the attenuated live virus may regain virulence.

Many attempts have been made to produce a satisfactory killed vaccine, but most of these have failed to give a lasting immunity and so have not been widely used. Doyle recently described a crystal-violet killed vaccine which in his hands and under laboratory conditions had given a satisfactory immunity lasting at least 14 months. This crystal-violet vaccine has not yet been tested in the field and the problems connected with its mass production have not yet been studied.

It will thus be seen that the utmost vigilance is called for on the part of all those concerned with the poultry industry, layman and veterinarian alike, if an immunisation policy is to be avoided.

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PIGS AND PIG PRODUCTION

THE article "Some Recent Trends in Pig Nutrition," by A. N. Worden, published in this issue, is a reminder of the return of the pig to its place in animal husbandry. Because of the restrictions imposed upon the industry during the war the pig population was reduced, the size of herds was limited and the small unit became more common than hitherto. Concurrently the problems which presented themselves to the veterinary practitioner differed greatly from those to which he had been accustomed. Balanced rations and orthodox methods of feeding were discontinued to a considerable extent because of the vital need to harness every possible source of food. This meant, in general, a fatter and more slowly maturing pig and such unorthodox feeding methods often resulted in the appearance of metabolic diseases of nutritional origin.

With hostilities at an end, the pig population increased slowly, but recently there has been a marked increase owing to an improvement in the feeding-stuffs position, while from the point of view of the veterinary practitioner the pig has been coming rapidly to the fore.

The keeping of pigs in large numbers brings its own problems and it is hoped that the small unit will be encouraged. The propensities of this animal as a scavenger are not yet appreciated fully and its value as a natural cultivator for the reclamation and improvement of rough and marginal land is beyond question. Also there are many valuable by-products of the pig industry which have been overlooked in our search for more meat.

Many will agree that the artificial state under which the pig is maintained has resulted in the appearance of conditions dependent upon the method of management or the feeding of this animal. In fact, problems related to such conditions constitute the greater proportion of those which we have to face to-day, and in the future it will be necessary to pay more attention to the nutritional requirements of the pig and learn to recognise those conditions, such as lameness, fits, unthriftiness and scurfy skins, which are attributable to nutritional errors. Good work has been done by workers in this country and in America but the store of knowledge must be increased even further before we are in a position to avoid the pitfalls.

We have heard less of infectious diseases during the last years but a rise in their incidence is to be expected. Swine fever is again causing concern. The importation of bacon and pork carries the risk of introducing swine fever and also Teschen disease (porcine encephalomyelitis). The low incidence of swine fever in this country when such importation has been low or in abeyance during war has been noted. In addition, we are faced with the possibility of the return of the old problems associated with defective management and nutrition which have been of little concern in recent years. This is a challenge for which we should be prepared.

(Continued at foot of next column)

CLINICAL COMMUNICATIONS

BOVINE KERATITIS ASSOCIATED WITH *MORAXELLA (HAEMOPHILUS) BOVIS*

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Keratitis of the bovine of an apparently infectious nature has been described in many parts of the world and several different agents have been suspected as the cause of the condition. Poels (1911) incriminated *Bacillus pyogenes* as the cause of the condition in Holland and transmitted the disease by sub-conjunctival inoculation of cultures. Satyendra (1915) incriminated an organism identical to the diplo-bacillus of Morax and Axenfeld in an outbreak of bovine keratitis in Bengal. This appears to be the first description of this diplo-bacillus in cattle.

Allen (1918) describes the isolation of a similar organism from an outbreak in Canada. He had difficulty in cultivating the organism and attempts to infect cattle from a culture on a serum medium were unsuccessful. He describes a smoky appearance of the conjunctiva with a clear copious discharge as constant symptoms. The condition could be reproduced by direct transference of infective material.

Jones and Little (1923) isolated a diplo-bacillus from cases of infectious ophthalmia examined by them in the U.S.A. Clinically their cases differed from those of Allen in the absence of the smoky cornea and the presence of a thick yellow discharge. They give a description of the cultural characters of the organism and succeeded in producing an ophthalmia by the ocular instillation of cultures. This organism was later classified as *Haemophilus bovis* by Hauduroy *et al.* In the sixth edition of Bergey's "Manual of Determinative Bacteriology" the organism is classified as *Moraxella bovis*.

Baldwin (1945) isolated a similar gram-negative diplobacillus from a high percentage of cases of contagious ophthalmia in America. He gives a description of the biochemical activities of the organism and states that he succeeded in producing keratitis by ocular instillation of cultures in 12 of 15 animals.

Farley *et al.* (1950) failed to produce the disease in cattle or experimental animals by the instillation of cultures of the organism obtained from Baldwin. Direct transmission of eye secretion, however, did set up the disease. They suggest that the organism is secondary in nature.

There does not appear to be any record of the isolation in Britain of an organism of the nature recorded by the American workers. There are, however, several reports of outbreaks of infectious keratitis.

Brown (1934) describes a "contagious ophthalmia" corresponding clinically to the keratitis described by Allen in Canada. Blakemore (1947) demonstrated inclusion bodies in two outbreaks of kerato-conjunctivitis in cattle, the bodies being similar to the rickettsial bodies described by

Coles in South Africa (1933). He succeeded in transmitting a conjunctivitis by means of eye secretions, but the condition set up was comparatively mild and he suggests that it may have been due to transferred secondary bacterial infection. Filtrates of eye secretion were non-infective. Bacteriological findings are not recorded. Craig and Ratter (1940) record an outbreak of keratitis in cattle originating with a Friesian cow imported from Canada. They failed to transmit the disease either with eye secretions from affected cases or mixed cultures of streptococci and micrococci isolated from the affected eyes.

In this account a description of an outbreak of keratitis in the Lothians of Scotland is given. The outbreak occurred in a herd of dairy cattle in the late summer. A similar outbreak had been seen in the previous year on a neighbouring farm, but no investigation was carried out. The clinical features were similar in both outbreaks.

Symptoms.—Five animals were found to be affected when the farm was first visited. One eye was affected in each animal and the lesions varied in severity. The earliest symptoms seen were a faint cloudiness of the conjunctiva on a spot immediately below the centre of the eyeball along with profuse lachrymation, marked photophobia and intense pain. Affected animals did not feed well and the milk yield was reduced.

Later the cornea assumed the typical smoky appearance described by Allen (1918) and vision was impaired. In one case a shallow ulcer was visible in the same position as the commencing opacity. No obvious ulceration was visible in the other cases. A marked conjunctivitis and a ring of congested blood vessels were visible in all cases. Two recovered animals in the herd showed a slight scar on the conjunctiva, but no other lesions were visible. Swabs were taken from all the affected cases and plated in the laboratory within two hours. The material was seeded on to 0·5 per cent. ox blood agar and meat broth and incubated aerobically and anaerobically. Smears were made from the swabs and stained by Giemsa. No inclusion bodies were found. In 18 hours a profuse growth of pearly colonies was present on the blood agar. Each colony was 2 to 3 mm. in diameter and surrounded by a narrow zone of haemolysis. The organism was isolated from four of the five cases examined.

Morphology.—The organism was a gram-negative rod measuring 1·5 to 2μ in length and 0·5 to 1μ in width. It occurred characteristically in pairs arranged end to end and in very short chains of four or six. The organism was non-motile and non-sporing and was destroyed by heating at 60° C. for ten minutes. A capsule was demonstrated by the nigrosin method.

Cultural Characters.—The best growth was obtained on blood agar or serum agar. After 48 hours a small pit formed under each colony. Growth was poor on ordinary agar and soon died out. In nutrient broth a very slight granular deposit was visible in 48 hours. In serum broth growth was still poor, but a more pronounced deposit was seen with slight turbidity above. Growth on gelatin was very slow with slight liquefaction. In litmus milk a deposit of casein formed. The media remained alkaline. Nitrates were not reduced nor was indol formed. There was no growth on McConkey. On coagulated serum deep pitting occurred in 24 hours and the medium was rapidly liquefied.

Biochemical.—Mannite, salicin, inulin, maltose, dextrose, sucrose, dulcite, dextrin, xylose, arabinose and lactose were not fermented.

Treatment.—Treatment consisted of the local application of sulpha preparations, but the results were not very satisfactory. In accordance with the treatment recommended by Jones and Little, zinc sulphate, 1 : 40 solution, was tried, which resulted in a rapid clearing up of the symptoms, and when used early in a case prevented the development of the opacity.

Pathogenicity.—Massive doses of the bacteria instilled into the eyes of guinea-pigs and rabbits had no effect even when repeated daily. Unfortunately before calves were available the organism had become rather pleomorphic and no capsule could be demonstrated. Attempts to transmit the disease from these cultures failed.

Discussion

The above organism appears to be identical with that isolated by the American workers from the condition known by them as infectious keratitis and the clinical syndrome described is very similar. There appears to be some doubt whether this organism is, in fact, the causal agent or whether some other factor is involved, since the transmission of the disease by instillation of cultures is unreliable.

Summary

Symptoms of an outbreak of keratitis in a dairy herd are described.

A description of an organism apparently identical with the *Haemophilus bovis* of the American workers is given. This organism does not appear to have been previously described in Britain.

A solution of zinc sulphate 1 : 40 appears to be highly effective in this condition.

Attempts to transmit the disease from cultures failed.

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SOME NOTES ON THE HEALING OF AN EXTENSIVE SKIN WOUND

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Dover

Subject.—A miniature poodle, one year old.

Examination.—The case was first seen with a large suppurating area 3 inches to 4 inches wide, extending from the tenth or eleventh rib, along the flank and down the external aspect of the right hind leg, almost to the hock.

Pain was very acute. The wound resembled a burn, but there was no history of this. All skin over the affected area sloughed off, leaving a large granulating area, comparatively clean but extremely painful. The right hind leg was useless, and the patient had difficulty in walking at all.

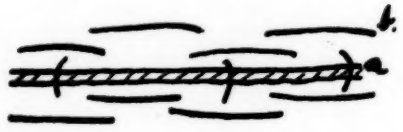
As healing by natural methods seemed doubtful it was decided to attempt some " plastic " surgery.

Procedure.—Under deep nembutal anaesthesia all unhealthy tissue was removed. Healthy skin had healed firmly to underlying tissue all round the edge of the wound, and had to be dissected away. The dissection was continued for about 1 inch back from the edge, and where possible muscle fibres and connective tissue were included in the skin flap, which was thus made $\frac{1}{8}$ inch to $\frac{1}{4}$ inch thick.

The skin was then gradually drawn over the wound, and was sutured firmly to the underlying tissue. By judicious stretching it was possible to cover almost the whole area, and the skin from opposite sides was brought into apposition. By straightening the stifle joint and drawing the leg forward the flank and thigh were covered with skin from the inguinal region. The whole operation took about one and a half hours.

Shaded area = area of wound.
Dotted line = final line of stitching.

Diagram of stitching pattern.



a. Skin edge.
b. Stitches.

Healing was uneventful. Dry dressings of thiazamide powder were applied daily, and the wound was painless after the second day. In eight days all stitches were removed (about 52 in all); there was no lameness, and only a narrow scar remains.

International Bibliography on Artificial Insemination.—To mark the inauguration of its centre in Milan, which will take place in the spring, the Institute " L. spallanzani " for Artificial Insemination proposes to publish an international bibliography on the process. Workers in this field are invited to co-operate and to forward copies of their publications, or clearly indicated references thereto, to the Director of the Institute, Via Flli, Bronzetti 17, Milan, Italy.

At a recent meeting the Società Italiana per il Progresso della Zootecnia, after having elected as President Professor T. Bonadonna, director of the above institute, decided to organise in the coming spring the 20th social meeting on the theme, " The hormones and vitamins in zootechny and veterinary science." The meeting will coincide with the inauguration of the new seat of the institute.

ABSTRACTS

[Experimental Allergic Encephalitis : Implications Regarding the Etiology of Demyelinating Diseases of Man and Animals. INNES, J. R. M. (1950.) *Brit. Vet. J.* **106**, 93.]

In this article, Dr. Innes has reviewed the literature on demyelinating diseases of man and animals, with particular reference to the question of aetiology. He did not propose to deal with demyelination caused by chemical substances, nor was he concerned with the rôle of viruses in demyelination, apart from referring to the belief that virus encephalitides are not associated with demyelination—a belief which, he states, may require some revision.

Dealing with the subject of neuroparalysis and demyelination following rabies vaccination, he lists three possible causes, (*a*) a modification of the original rabies virus infection, (*b*) some other virus or toxin potentiated by the injection or (*c*) some sensitising effect produced by the inoculation of foreign nervous tissue. Of these three factors the first is regarded as obsolete, since neither in animals nor in man has any infectious agent been isolated from the brains of cases of post-vaccinal encephalitis, and further, it is known that the rabies virus does not cause demyelination.

The theory that demyelination may be the result of sensitivity to the inoculation of foreign nervous tissue is more tenable and is upheld by the work of many authors. Rivers *et al.*, for example, demonstrated that repeated injections of heterologous brain emulsions into monkeys caused a severe demyelinating encephalitis.

Approaching the problem from a different angle, that of immunology, the lead was given by the discovery that antibody titres to substances not related to tubercle bacilli were higher in tuberculous guinea-pigs than in non-tuberculous controls. Further experiments led to the idea that antibodies at higher titres could be produced by incorporating an antigen into a fatty substance with heat-killed tubercle bacilli—the so-called adjuvants. This gave rise to the suggestion that autosensitisation or autoantibody formation might be a mechanism in the causation of certain demyelinating diseases. This view was upheld by experiments in monkeys which were inoculated with brain tissue emulsified in paraffin with heat-killed tubercle bacilli. In these animals, demyelinating lesions were produced in 17 to 60 days, after one to three injections.

Further experiments in monkeys, using homologous brain, have made it possible to postulate that an antibody to injected brain tissue reacts with the nervous tissue to produce demyelination. The responsible antigen is essentially or predominantly in the white matter, for foetal brain is innocuous until myelin appears. The antigen is destroyed by alcohol, but is resistant to formalin and heating. The function of the adjuvants in the production of the brain lesions may be merely to accelerate the demyelination or to initiate an epithelioid cell reaction in close proximity to the antigen.

The experiments referred to may point the way to a clarification of diseases such as disseminated sclerosis, post-vaccinal encephalitis and other nervous disorders in man, and " hard pad " disease and swayback in dogs and sheep respectively.

The author concludes by remarking that it is not likely that post-vaccinal encephalitis will follow the use of Dunkin-Laidlaw distemper vaccine, owing to the nature of the inoculum, but it might possibly follow louping-ill vaccination in sheep.

I. W. J.

[The Influence of Diet on Dental Development in the Sheep. FRANKLIN, M. C. (1950.) *Bull. C.S.I.R., Australia.* No. 252. Pp. 34 + 23 plates.]

The investigations reported were experimental laboratory studies on weaned lambs, some of which were reared from birth in pens while the others were transferred from good pasture when approximately six months old. All were fed for several months on rations of cereals, roughages and grains or their by-products with a CaO content ranging from 0·07 per cent. to 0·16 per cent. and a P_2O_5 content from 0·33 per cent. to 0·90 per cent. and with a $CaO : P_2O_5$ ratio from 1 : 3·2 to 1 : 6·5. The abnormalities observed when such rations were used were rarely seen in similar groups receiving an addition of 1 per cent. of ground limestone to their diet. The few exceptions appeared to be due to an inability on the part of individual animals to utilise the calcium supplement efficiently.

The dental irregularities of the weaners on the deficient rations included delayed eruption of both incisor and molar teeth. In two instances no permanent incisors had erupted at three years of age, even though the nutrition of these animals had been satisfactory during the last two and a quarter years. Overgrowth of the molar teeth with undergrowth of the corresponding teeth in the upper or lower jaw respectively was a common occurrence. Impaction of the third molar was frequent due to failure of the mandible to elongate normally.

Faulty pre-natal development did not exert a harmful effect on dental development. Although the most exaggerated irregularities occurred among sheep which had access to the deficient rations whilst still running with their mothers and which were subsequently weaned on to the same rations for several months, gross changes were also observed in older weaners which were taken off good pasture when six months old and fed on calcium deficient cereal rations.

Bodyweight was of importance, as was clearly shown in one group in which the heaviest animal at the commencement of the experiment was only slightly affected by the deficient ration, whereas the lightest was the most severely affected. Another experiment showed the effect of plane of nutrition, for when associated with a low calcium intake or calcium phosphorus imbalance, a high plane of nutrition had more serious effects on dentition than a low plane.

In addition, there was a generally defective calcification which occurred in sheep fed on the unsupplemented cereal ration. General stunting of the whole skeletal structure occurred which was still evident at maturity. Defective development of the anterior portion of the mandible undoubtedly was responsible for some of the incisor irregularities observed, such as overcrowding with consequent abnormal angles of eruption or failure to erupt. There was an "undershot" appearance of the incisors of a number of sheep fed on the deficient rations, which was absent or less obvious in those with a calcium supplement.

There is a close similarity between the dental abnormalities resulting from calcium deficiency and calcium phosphorus imbalance and those occurring in chronic fluorosis. The similarity is so striking that fluorine analyses are needed to differentiate between the conditions.

In the field it has been observed that in New Zealand, where improved pastures are available for grazing over the greater part of the year, undershot jaws are not as prevalent as in Australia, where periods of stress in pasture growth and droughts lead to the feeding of cereal rations of the type used in these experiments, without correcting the mineral deficiency and imbalance.

J. O. L. K.

[The Agglutination Test in Vibrionic Abortion of Sheep. LEVI, M. W. (1950.) *J. comp. Path.* **60.** 65.]

Formalinised suspensions prepared from liver agar cultures of five freshly isolated strains of *V. foetus* obtained from different outbreaks of abortion in ewes were tested against sera obtained from normal sheep and sheep that had aborted and against specifically prepared rabbit anti-sera.

The sera of 52 normal sheep agglutinated the five suspensions to titres varying from 1 : 40 to 1 : 160, variation being influenced by the suspension, two suspensions giving the lower and three the higher critical titres.

The sera of 46 out of 57 infected ewes agglutinated homologous suspensions to a titre higher than in normal sheep. A fall in titre due to delay in blood sampling after abortion was confirmed. The number of false negatives increased with the use of heterologous suspensions.

Comparable tests with rabbit anti-sera confirmed that the discrepancies noted with normal and infected sheep sera were due, in part at least, to an inherent difference in the antigenic structure of the strain used as antigen.

In the view of the author, these discrepancies are such as to render the agglutination test unacceptable at present as a routine diagnostic method of *V. foetus* infection in ewes. The value of freeze drying *in vacuo* for the preservation of cultures is confirmed.

W. T. R.

HILL FARMING IMPROVEMENT SCHEMES IN ENGLAND AND WALES

In a recent announcement the Ministry of Agriculture states that marked progress continued to be made during 1950 with the improvement of hill farms in England and Wales with the help of grants under the Hill Farming Act. These grants amount to one-half of the cost of the work done. Improvement schemes are voluntary and must include sufficient improvements to put the farm into proper working order.

By the end of the year 3,248 schemes had been approved or were under consideration. They related to 3,898 holdings, representing about 25 per cent. of the hill farms in the country and covering some 1,145,000 acres. Over 82 per cent. of these live schemes had been approved formally or in principle and work had been started on 1,960 of them.

Of the total estimated cost of £4,665,000, work on the improvement and erection of farm buildings accounted for 22 per cent. Next in importance were the building and modernisation of cottages and houses (17 per cent.), the improvement of grazings by manuring, reseeding and the laying down of permanent pasture (16 per cent.), and work on fencing (10 per cent.) and roads and bridges (6 per cent.), liming (5 per cent.), water supplies (4 per cent.), drainage (4 per cent.) and electricity supplies (3 per cent.).

"A considerable amount of work has already been completed. Grant paid in England and Wales so far amounts to some £111,000 representing work costing £222,000 done and paid for, but applications for grant have been slow in coming in, although they are now being submitted increasingly rapidly. In particular promoters need not wait until all the work in a scheme has been done; once a scheme has been approved grant can be paid by instalments as the work progresses.

"At the end of 1950, the estimated cost of all live schemes for the whole of the United Kingdom was £8,740,000. Under the Hill Farming Act only £4,000,000 are at present available for grant. The Livestock Rearing Bill, which is now before Parliament, is intended to amend and extend the Act. In particular, it (i) widens the class of land eligible for improvement grant so as to include livestock rearing land on the lower slopes of the hills in the upland areas, (ii) extends by five years the period during which schemes may be submitted and (iii) increases the funds available for grant to £20,000,000, a sum which may be further increased, if necessary, by not more than £2,000,000 by order made by the Ministers with the consent of the Treasury and the approval of Parliament."

REPORT

[Agricultural Improvement Council for England and Wales. Second Report: 1950. Pub. for Min. of Agric. & Fish. by H.M.S.O. 1s. 26 pp.]

The first report of the Agricultural Improvement Council was presented in 1942 and since that date short notes on the work of the Council have been published in *Agriculture*. The National Agricultural Advisory Service came into being in 1946 and the closest relationship exists between the Council and this body. The Council is an advisory body only, and having no technical staff of its own is dependent on the Advisory services for: (*a*) putting the findings of research into practice and (*b*) obtaining an over-all view of the farmers' problems. In 1944 the terms of reference of the Council were revised with two main objectives; the first was the application of the results of research to agricultural and to horticultural practice and the second was the sifting and recommendation of those problems in agriculture and in horticulture which required investigation. One method, adopted to be well informed, was to make available to the Secretary of the Council the deliberations of the various standing committees and conferences set up by the Agricultural Research Council. It was therefore possible, with a minimum staff, to follow the progress of research; the main source of the technical information on the changing needs of agriculture is the National Agricultural Advisory Service.

When an investigation has reached the point where it has been proved that certain results can be expected on a laboratory or small-plot scale, there is still much to be done before it can be applied in practice. A chain of Experimental Husbandry Farms and Horticulture Stations is therefore in process of being set up for this purpose, especially where it is necessary for the results of research work to be tested under different conditions of soil and climate.

The increasing interest, and demands for investigations into problems, have complicated the task of selection. A close liaison is maintained with the National Farmers' Union and various Husbandry Groups have been set up by the Council. Groups, with a personnel of four, for Crop Husbandry, Animal Husbandry, Grassland Husbandry, Poultry Husbandry and Horticulture are in being, and any body of substance can place a problem before the appropriate group; recommendations may then be made to the Council.

A number of problems have already been considered and a few of major interest are mentioned. They include:, hill sheep farming—dealt with because of the deterioration of hill grazings; artificial insemination—because of its widespread use in commercial herds; bloat in cattle—it is hoped that collaboration between Veterinary Investigation Officers and Grassland Officers will yield information of some importance; pig and poultry rations—it has been shown that Australian sorghum can successfully replace maize or barley in pig rations on a lb.-for-lb. basis without affecting growth rate, carcase quality or bacon flavour, whilst in poultry sorghum can replace up to 50 per cent. of mixed cereals in the diet of adult birds without affecting egg production, though it is not so successful in displacing mixed cereals for chickens.

The dairy industry has its difficulties and those which have claimed the Council's attention include the chemical sterilisation of dairy utensils and a less laborious routine in the cowhouse. Problems connected with the poultry industry and with crops are also dealt with, and the brief outline given reveals the breadth of the interest taken in the extensive ramifications of agriculture and horticulture.

R. L.

REVIEW

[The Art of Scientific Investigation. By W. I. B. Beveridge. (1950.) London: William Heinemann. 168 pp. 10s. 6d.]

The human brain is the most important item in the apparatus necessary for scientific investigation and the author aims at showing how the mind of man can best be harnessed for this purpose. His contribution therefore deals mainly with the human element and with the strength and weaknesses of the individual scientist. It is said that the book will be of value to the younger scientist and, as it is supremely readable, it will be of interest to the layman.

There are about a dozen chapters in all, in which the application of reason, intuition and imagination to research is discussed; others deal with experimentation and observation, the planning and organising of research, the attributes required for such work and the ethics, rewards and incentives. The opening chapter is on "Preparation" and the author writes of the obligation to keep abreast of the growth of knowledge; his advocacy is that one should read critically and maintain a healthy scepticism. It is therefore justifiable to be critical of the author's temerity in branching out into a field of applied psychology when his own field is a study of infectious diseases. It is difficult to imagine how such a book is to be of value to the young scientist, for he would be better employed reading the literature of his own subject in a critical manner; the layman will not appreciate the many references which are intelligible to the experienced investigator alone. One is not sure for whom the book is suitable though many will read it for its interest and the older well-versed individual will find much to irritate, and much provocation, because of the didactic statements.

Not many will agree that "hypothesis is the principal intellectual instrument in research." Some discoveries are accidental and fall into no hypothetical structure but nevertheless they add their quota in unfolding truth. One is reminded of Saul who went out to look for his father's asses but found a kingdom; one American scientist coined the word "serendipity" for discoveries made thus, and they are many. Is it not more in keeping with the older successful scientists to sit before nature as a little child rather than to stand as an adult and attempt to unravel the secrets of nature by force? There is virtue and profit in humility. The author has selected a vast number of stories and pithy sayings of our earlier workers and the book is full of texts suitable for sermons for embryological research workers. Great leaders have attracted their followers by offers of work, sweat, blood and other discomforts; the joy of discovery and the thrill of the chase overshadows the disappointments, the frustrations and the weariness which is the lot of the research worker so frequently. It is hoped that any further contributions on this subject will not fail to labour the latter aspect for the easy time is not the lot of him who unravels the unknown.

Scientific investigation is an art and is therefore difficult to analyse and dissect and one therefore agrees that the title of the book is well chosen. There are so many different types of mind, and so many different approaches to so many problems, that the didactic method of the book does not agree with the examples given in the text. The reply given by one bacteriologist that he was just playing when he made a discovery reveals a mind and approach different from the technique essential for planning experiments to prove a hypothesis. Both are of value, and there are others and these have no mention; the book of Ecclesiasticus, chapter 44, begins with "Let us now praise famous men," but it goes on in the ninth verse to "some there be which have no

(*Concluded at foot of next column*)

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address. It is regretted that consideration cannot be given to questions for which solely a private reply is required.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Oedematous Calves

Q. 375.—*What is known of* (*a*) *the cause,*
(*b*) *the pathology and lesions and*
(*c*) *the breed distribution?*

A.—(*a*) Present indications are that congenital oedema of calves is the result of the doubling of a recessive lethal factor showing true mendelian inheritance :—

o = recessive oedema factor
O = corresponding normal factor

OO———	———Oo	
normal animal	animal carrying recessive factor	Mating of normal with carrier animals produces no apparent effect.
50% OO	50% Oo	
Oo———	———Oo	
25% OO Normal	50% Oo Apparently normal	25% oo Oedematous calves

Mating of animals carrying recessive factor gives a ratio of 1 oedematous calf in 4 births.

While the above view fits the facts, a caution is necessary since the somewhat analogous condition of hydrops foetalis in human medicine was explained in a similar manner until disproved by the discovery in 1940 of the iso-immunising "Rh" factor. Veterinary haematologists have so far failed to demonstrate the implication of a similar factor.

(*b*) Contemporary and as yet uncompleted work suggests that there is an abnormal increase in foetal blood pressure producing cardiac changes of

1. Left ventricular hypertrophy and
2. Right ventricular dilation.

These changes are thought to be responsible for the oedema. Lesions at birth include the heart changes as noted above and a variable amount of subcutaneous oedema commencing particularly in the head and limbs. The peritoneal cavity contains a variable excess of fluid. Skeletal development is normal (the term "bulldog," commonly applied to this type of calf, is therefore erroneous). The calves are usually alive at point of parturition and while dystocia is usual and often severe a small proportion are born alive and live to show a persistence of the oedema. The sex incidence is equal and the placenta shows a gelatinous oedema.

(*c*) The condition has been reported in several breeds but seems to be most common in Ayrshires.

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Calculation of Weight of a Fat Steer or Heifer

Q. 376.—*Could you please tell me if there is a formula to calculate roughly the weight of a fat steer or heifer? I mean by measuring with a tape, height and diameter of chest, etc.*

A.—Various methods have been suggested for calculating the live and dead (butcher's meat) weight of cattle from measurements taken of the live animal; none, however, can be regarded as of any real practical use, since the variables are so great that no hard-and-fast rules can be laid down. Recently a formula for calculating the weight of bacon pigs, based on body measurements, has been evolved and this would appear to be a method of some promise.

On the assumption that 576 cubic inches of the body represents 14 lb. in weight, the following formula for cattle has been suggested :—

Girth × girth × length × 5, divided by 21 = weight in units of 14 lb. A modification of this is, girth × girth × length × applicable constant = bodyweight in units of 14 lb. (Constants are : moderately fat beasts 0·23, fat beast 0·24 to 0·25.)

These give the supposed bodyweight and to arrive at the killing out weight, or butcher's meat derived from the animal, a good deal of skill is required since yields may vary from 45 per cent. to 70 per cent. The old butcher's 8 lb. stone as opposed to the Imperial stone of 14 lb. is a rough guide (57 per cent.), although it may be rather too liberal since the U.S.A. Bureau of Animal Industry gave the average carcase yield of cattle as 53 per cent. The world record dressing percentage (Aberdeen Angus) stands at 76·78, but such a percentage implies a grossly fat animal which would be uneconomical to the butcher; indeed, anything above 60 per cent. is usually from animals which are too fat to be profitable to him.

In 1943 the Ministry of Agriculture grading was as follows : Specials 58 per cent. and over, Grade A 55 per cent. to 57 per cent., Grade B 52 per cent. to 54 per cent., Grade C 50 per cent. to 51 per cent., for home-bred steers and heifers. Special (*a*) for young cows with estimated killing out percentage of 54 and over and Grade A 53 per cent. to 55 per cent., Grade B 50 per cent. to 52 per cent., Grade C 48 per cent. to 50 per cent. for fat cows. Bulls were graded as Special (*a*) for young bulls without permanent incisor teeth 54 per cent. to 56 per cent. +, whilst other bulls were graded as A 55 per cent. to 57 per cent., B 52 per cent. to 54 per cent. and C 50 per cent. to 51 per cent.

Messrs. Dring & Fage, of 150, Tooley Street, London, S.E.1, used to make a slide rule, which was used by purchasing officers in the 1914–18 war, for calculating the yield of cattle from body measurements (length and girth in feet) with standards for various breeds and degrees of fatness, giving units of London stones of 8 lb., Imperial stones of 14 lb., Edinburgh stones of 17½ lb. and scores of 20 lb. It is possible this firm may still have some of these available but even assuming that the slide rule was a reasonably accurate guide in the hands of one person, there would bound to be a divergence of results in other hands, since ideas as to classification into half fat, moderately fat, prime fat, very fat and extra fat are certain to differ very considerably.

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memorial," and in the 13th verse we are told that "their glory shall not be blotted out." There is a great host of workers who are destined to fit into this category and their minds and brains are as important as those who purport to, but do not always, lead them. There appears to be a lack of appreciation of the fundamental difference between research and an investigation, and there are one or two minor points which need correction. Some who have died recently would appear to be still alive because of the use of the present tense; was it cabbage or was it mangels that influenced the reactivity of guinea-pigs to diphtheria toxin? Was Shaw Dunn an Englishman? His Scottish characteristics were apparent to all who met him. With all its imperfections and irritating statements, one person quite enjoyed reading this book.

REFERENCES

GERRARD. Meat Technology. (Leonard Hill, Ltd.)
OSTERTAG. Textbook of Meat Inspection. (Baillière, Tindall & Cox.)
THORNTON. Textbook of Meat Inspection. (Baillière, Tindall & Cox.)

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Scottie cramp

Q. 377.—*Would you please supply me with information on the syndrome known as "Scottie cramp," with special reference to aetiology and treatment.*

A.—The condition known as "Scottie cramp" is, as the name suggests and so far as is known, confined to the Scottish Terrier. Broadly speaking, the syndrome comprises cramp following exercise; cases vary in severity from the very mild case in which little is noticed other than some difficulty in ascending steps after a period of vigorous exercise to the acute case in which brisk trotting exercise for 100 yards or so will provoke a cramp so severe that not only do the hind limbs fail, but the condition appears to spread forward along the spine until the dog curls up like a hedgehog and falls over. In severe cases the cramp is so marked that rigidity of the affected muscles may cause the dog, when picked up, to appear to be in a state of tetany. Spontaneous recovery from each attack follows rest, to be followed again by a further attack when exercise is resumed.

Symptoms are usually noted for the first time at any age between four and eight months; mild cases usually reach maximum severity at 12 to 15 months old, spontaneous recovery occurring by about two to two and a half years. The writer has seen one quite severe case become virtually normal by seven years of age. Really severe cases are unmanageable as a rule and destruction is the usual course.

The condition is without any question a hereditary one, but the respondent cannot say if its genetic character has yet been worked out.

The writer believes the condition to be one of angio-spasm, caused by some defect in the neuro-vascular mechanism. In some respects the condition may be analogous to Raynaud's disease in man. The nervous origin is borne out by the fact that in some cases slight sexual excitement may cause unusually rapid onset of an attack. If this suggestion as to aetiology is correct, it will be appreciated that treatment on routine lines is unlikely to be of value although mild sedation associated with cardiac stimulation to ensure maximum circulation to the peripheral parts of the body should be attempted in each case. It is probable that section of the lumbar sympathetic chain would give considerable, if not complete, relief for a sufficient length of time to allow natural recovery to be taking place. Unfortunately, lumbar sympathectomy is as yet scarcely a practicable operation in canine practice.

In view of the hereditary nature of the condition advice should always be given to abandon breeding from dogs known to be affected, and possibly even from clinically unaffected litter mates. Constructive efforts to this end by Scottish Terrier breeders would probably eliminate the disease in a relatively short time.

FOWL PEST: STERILISATION OF POULTRY FOOD

At the opening of the sitting of the House of Lords on Wednesday of last week, the Earl of Listowel, Parliamentary Secretary, Ministry of Agriculture, answering questions by Lord Hawke and Lord Sandhurst, said the Ministry had no conclusive evidence that the source of fowl pest was in American camps in this country. To avoid any possible risk, however, it had been arranged with the consent of the American authorities, for all waste foodstuffs from American camps to be sterilised before being used for animals.

QUESTIONS IN PARLIAMENT

Fowl Pest

Sir I. FRASER (January 31st) asked the Minister of Agriculture whether he will make a statement about the effect on the supply of home-produced eggs of the present outbreak of fowl pest.

Mr. G. BROWN: My right hon. Friend cannot at present forecast what the future course of this outbreak may be and is, therefore, unable to estimate what effect it may have on the supply of eggs. Up to the present, the number of birds slaughtered because of the disease amounts to only about 0·3 per cent. of the total poultry population of Great Britain and there should not yet have been any appreciable effect on egg supplies.

Sir WALDRON SMITHERS (February 1st) asked the Minister of Agriculture how many fowls and how many turkeys have been destroyed as the result of the recent outbreak of fowl pest; what is the cost of compensation to date; and why they were not used for food.

Mr. T. WILLIAMS: From the beginning of last October to January 27th, about 140,000 fowls and 1,750 turkeys had been slaughtered as a result of outbreaks of fowl pest. Compensation amounts to about £172,000 for the fowls and £15,000 for the turkeys. It is probable that most of the birds that have been killed by direction of my Department were infected. To have permitted the carcases of those birds to have been disposed of for human consumption would have involved a grave risk of the spread of disease to other flocks.

Sir W. SMITHERS: Is the Minister aware that I am informed by poultry breeders that hundreds of birds were killed which were not infected? If they were killed, will he say why they were not used for human consumption?

Mr. WILLIAMS: I answered the last part of the supplementary question in my original reply. This policy is adopted on the advice of my veterinary experts.

Mr. NABARRO asked the Minister of Agriculture how many cases of the American virus type of fowl pest have been reported in the United Kingdom since December 1st, 1950; how many fowl have been slaughtered under direction of his Department's officers since that date as a result of this type of fowl pest; and what is the aggregate compensation payable.

Mr. T. WILLIAMS: There have been nearly 300 outbreaks of the subacute type of fowl pest since December 1st. About 145,000 birds have been slaughtered, involving compensation of approximately £192,000.

Mr. NUGENT asked the Minister of Agriculture the weight of dead poultry imported from countries known to have fowl pest for the years 1949 and 1950 respectively, and the percentage these figures are of the total annual supply of dead poultry, both home produced and imported, for these years, respectively.

Mr. T. WILLIAMS: The weight of dead poultry imported during the years 1949 and 1950 from countries known to have fowl pest was 6,764 and 8,050 tons respectively, or 5·3 per cent. and 6·3 per cent. of the total supply of dead poultry from all sources for these years.

Mr. NABARRO asked the Minister of Agriculture how many fowl have been slaughtered in Worcestershire since December 1st, 1950, under direction of his Department's officers, as a result of the United States virus type of fowl pest; how many cases have been detected; and what is the total sum payable by his Department in compensation.

Mr. T. WILLIAMS: So far, there has been one outbreak of the subacute type of fowl pest in Worcestershire. Fifty fowls were slaughtered, and the sum payable as compensation amounts to £219.

Mr. NABARRO: Is the Minister aware that this case involved the slaughter of very valuable pedigree poultry as the result of a blood test taken by his officer? Can he assure the House that the positive result of a blood test is an infallible means of establishing that the bird is infected and is a carrier of this mild form of disease?

Mr. WILLIAMS: I assure the hon. Member, on the advice of my chief veterinary officer and veterinary staff, that this is the best possible method of dealing wih outbreaks of fowl pest. I should deprecate any amateur, whether for political or other reasons, attempting to overrule this.

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SWINE FEVER (VACCINE)

Mr. P. WELLS (February 1st) asked the Minister of Agriculture whether he is satisfied that the standard of crystal violet vaccine produced in this country is sufficient to afford immunity from swine fever.

Mr. T. WILLIAMS: Yes. Extended trials which were made of the

vaccine before it was issued showed that when used correctly it confers a good measure of protection against swine fever.

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HORSES (EXPORT AND SLAUGHTER)

Commander NOBLE (February 1st) asked the Minister of Agriculture what steps he is taking to prevent the overloading and resultant suffering of horses on transport for slaughtering.

General Sir GEORGE JEFFREYS asked the Minister of Agriculture whether he is satisfied with the arrangements for the transport and accommodation of horses imported from Ireland for food purposes.

Mr. T. WILLIAMS: The Departmental Committee on the Export and Slaughter of Horses recommended last year that certain additional measures should be taken to protect horses against suffering while being carried in rail and road vehicles. To give effect to these recommendations I propose to make an Order under the Diseases of Animals Act, 1950. Consultations have been taking place with the other Departments and organisations concerned, and I expect to be in a position to make the Order at a very early date.

Mr. SUTCLIFFE: Can the Minister say why there has been such a long delay, because he made an almost exactly similar announcement in reply to a Question in the middle of December?

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RABIES CONTROL

Mr. J. RODGERS (January 29th) asked the Minister of Agriculture in view of the long duration of the present quarantine period, what steps he is taking to develop a form of anti-rabies inoculation which would overcome or shorten the period.

Mr. T. WILLIAMS: Published reports of work on the control of rabies undertaken by research workers are studied by my veterinary staff, but it is not possible for my Department to undertake direct work in this field at the present time since its facilities for carrying out research into animal diseases are already fully employed on problems of immediate importance of food production.

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ROAD ACCIDENTS (DOGS)

Mr. PANNELL (January 29th) asked the Minister of Transport whether he is aware that in Leeds there are about 4,600 road accidents each year and that no fewer than one-quarter of these are caused by dogs; to what extent this state of affairs is general throughout the country; and whether he is prepared to introduce legislation to offer a remedy.

Mr. BARNES: The accident statistics kept by my Department are restricted to those involving death or personal injury, and during 1949 2,187 such accidents, representing 1·5 per cent. of the total in the country as a whole, were reported by the police as being primarily due to dogs in the carriageway. The comparable figures for Leeds were 30 and 2 per cent. I do not think that it would be practicable to deal with the matter by legislation, but I hope that the inclusion on dog licences of an appeal to dog owners to keep dogs under control on the roads will have a good effect.

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MOTOR CARS (HOME MARKET)

Mr. VAUGHAN-MORGAN (January 29th) asked the Minister of Supply what proposals he has received from the motor industry to ensure a fair distribution of new cars in 1951; and if he will make a statement.

Mr. G. R. STRAUSS: In delivering cars to the home market, the motor industry will continue to give preference to the urgent needs of doctors and midwives. The industry has recently announced the extension of the period of the covenant governing the re-sale of new cars from one year to two years, and has asked distributors and dealers to ensure that, unless there are exceptional circumstances, no new car is supplied to anyone who already has a serviceable post-war car.

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FRENCH MEAT

Mr. KEELING (January 29th) asked the Minister of Food what difficulties prevented a larger importation of fresh meat from France.

Mr. WEBB: Subject to veterinary safeguards, we are prepared to take all the meat which France can send provided that the quality and price are right. So far it has been possible to meet these two conditions only to a very limited extent.

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BLACKSMITHS (RURAL AREAS)

Mr. NIALL MACPHERSON (February 1st) asked the Minister of Labour whether he will grant postponement of National Service to blacksmiths in rural areas in the same way as he does to agricultural workers; and how many men he estimates would be affected by such a course.

Mr. BEVAN: It has been the practice to allow deferment of call-up to rural craftsmen, such as blacksmiths, in exceptional instances where the withdrawal of their services would seriously interfere with food production. In view of the manpower needs of the Services I am not in a position to extend the scope of these arrangements. I am unable to estimate the numbers involved.

Mr. MACPHERSON: Would the right hon. Gentleman define what he means by "exceptional instances," in view of the fact that farmers depend very largely for the repair of their farm machinery on the services of blacksmiths?

Mr. BEVAN: I suppose that the instances would be in very remote districts where alternative sources would not be available; but, although farming is dependent on these arrangements, there are other industries which also depend on definitions of this kind.

NOTES AND NEWS

Diary of Events

Feb. 14th.—Meeting of the Editorial Executive Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

Feb. 15th.—Meeting of the Herts. and Beds. Veterinary Society at Luton (The George Hotel), 2.30 p.m.

Feb. 16th.—Meeting of the Society for Endocrinology, at the Meeting House of the Zoological Society, Regent's Park, London, N.W.8, 11 a.m. (See Notice.)

Feb. 17th.—Meeting of the Biochemical Society in the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, 11 a.m.

Feb. 20th.—Annual General Meeting of the Eastern Counties Division, N.V.M.A., at Norwich (Bell Hotel), 11 a.m.

Feb. 21st.—Annual General Meeting of the Scottish Metropolitan Division, N.V.M.A., at the Royal (Dick) Veterinary College, Edinburgh, 2.15 p.m.

Feb. 21st.—Royal Society of Medicine, Section of Comparative Medicine: Laboratory Meeting at the Royal Veterinary College, Camden Town, N.W.1, 4 p.m.

Feb. 22nd.—Annual General Meeting of the South-Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 2.30 p.m.

Feb. 23rd.—Liverpool University Veterinary Society's Annual Ball.

Feb. 23rd.—Annual General Meeting of the Royal Counties Division, N.V.M.A., at Reading (Caversham Bridge Hotel), 2.30 p.m.

Feb. 23rd.—Glasgow University Veterinary Medical Association Annual Ball, in the Ca'dora Ballroom, Glasgow.

Feb. 27th.—Meeting of the Society of Women Veterinary Surgeons at the Royal Veterinary College, N.W.1, 6 p.m.

Sept. 23rd-29th.—Sixty-ninth Annual General Meeting and Congress of the National Veterinary Medical Association, at Eastbourne.

QUARTERLY MEETINGS OF COUNCIL AND STANDING COMMITTEES N.V.M.A. DURING 1951

The following dates are given for remaining meetings this year, chiefly to give members plenty of time to reserve hotel accommodation.

IN LONDON

Monday, April 16th:
2 p.m. Organising Committee
4 p.m Parliamentary and Public Relations Committee.

Tuesday, April 17th:
10 a.m. Veterinary State Medicine Committee.
12 noon Home Appointments Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, April 18th:
11 a.m. Council

IN EDINBURGH

Wednesday, July 11th:
11 a.m. Home Appointments Committee.
2 p.m Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 12th:
11 a.m. Veterinary State Medicine Committee.
2 p.m. General Purposes and Finance Committee.

Friday, July 13th:
11 a.m. Council.

Dishorning of Cattle

The Technical Development Committee of the Association has under review methods of dishorning cattle, and is particularly anxious to secure information on methods used in practice.

Dishorning by the Rubber Ligature Method

Information is required, particularly, on methods of dishorning using rubber bands or ligatures, with special reference to (*a*) technique used, (*b*) pain involved during the whole process of the removal of the horn, and (*c*) reliability in effecting removal of the horn, and length of time taken.

It would assist the Committee greatly if members would respond promptly to this appeal for information by writing on the subject to the General Secretary, N.V.M.A., 36, Gordon Square, London, W.C.1. It would be much appreciated if letters could be received not later than February 24th, 1951.

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Motor-cars—Running Costs

The N.V.M.A. desires to obtain from as many members of the profession as possible reliable figures regarding the running costs of the motor-cars in use by them, with the object of bringing the Association's information more up to date and to assist it in making representations with regard to the mileage allowance to veterinary surgeons for official work, should such representations be necessary. (Figures which have been worked out by accountants would be particularly valuable.)

Members of the profession are therefore invited to furnish the General Secretary, N.V.M.A., 36, Gordon Square, London, W.C.1, with the following information:—

The estimated cost per mile of running a car in veterinary practice, with particular reference to horse-power.

It would assist the Association further if this cost could be analysed and the following information given:—

(*a*) Initial cost of car and amount set aside for annual depreciation.

(*b*) Horse-power tax and insurance.

(*c*) Annual repair expenses.*

(*d*) Expenditure on tyres.

(*e*) Expenditure on petrol and oil.

(*f*) Total annual mileage and average mileage per gallon.

* Where cars exceeding two years of age are in use comparative repair bills with cars less than two years of age would be of value.

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FEWER CARS FOR HOME MARKET

In our issue of January 20th we wrote: "The decision to cut the supply of sheet-steel to motor-car manufacturers by 15 to 20 per cent. has greatly aggravated an already serious position. There is no alternative but for the Government to reintroduce forthwith a permit system, with adequate safeguards to prevent abuse. Under such a system veterinary surgeons should, in the national interest, be given the highest degree of priority." The force of this contention was borne out with early emphasis on Thursday of last week, when it was announced that the Minister of Supply, Mr. G. R. Strauss, had asked the motor industry to limit home deliveries in 1951 to 80,000 cars and 80,000 commercial vehicles (including 8,090 public service vehicles). This represents a reduction of 30,000 cars and 15,000 commercial vehicles on the quotas announced by the Minister last month.

The industry is expected to receive in the first quarter of this year approximately 85 per cent. of the sheet-steel deliveries of the last quarter of 1950, and it is hoped that supply will continue at the same level in the second quarter. The Ministry states that deliveries to the industry should improve towards the end of the year, but the total supply in 1951 is bound to be less than in 1950. The effect of this on the supply of vehicles to the home market was discussed at a meeting of the national advisory council for the motor manufacturing industry at the Ministry of Supply on Wednesday.

The Minister announced in the House of Commons on December 4 that the home quotas for cars and commercial vehicles this year would be 110,000 and 95,000 (including 8,500 public service vehicles) respectively, but that the position would be reviewed from time to time.

It is not possible to estimate with any assurance, but the output of cars and commercial vehicles in 1951 may be about 460,000 and 230,000 respectively, compared with approximately 520,000 and 260,000 in 1950. The economic situation demands that the vitally important exports of the motor industry should be reduced as little as possible.

The advisory council was informed that the Minister had decided that the fall in output must be shared equally between the home and the export markets, and he had therefore asked for the new limit on home deliveries.

If output in 1951 exceeds provisional estimates, it is at present intended that the extra vehicles will be divided equally between the home and export markets. Individual manufacturers will be told their revised home quotas soon.

Car Price Increases.

It is as an ironic commentary on the situation that we record that, on the same day, increases in the price of cars manufactured by the Rootes Group were announced. A statement says "The group is now confronted with further material increases (in the cost of basic materials) and, in common with other manufacturers, a cut in total production and the increase in retail prices is, therefore, inevitable."

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PERSONAL

Birth.—Stevens.—On January 26th, 1951, at Kent House, Southsea, to Hermine, wife of W. A. Squire Stevens, M.R.C.V.S.—a son.

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Retirement Presentation.—Mr. Patrick M'Kinlay, M.R.C.V.S., who recently retired from his practice in Stranraer after 47 years, has been presented with a silver salver from farmers in South Ayrshire and Wigtownshire. Mr. M'Kinlay, a native of Dumbartonshire, was at Annan and Kendal before going to Stranraer, where he was meat inspector for the town.

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Mr. S. L. Hignett Visits Antigua.—At the request of the Colonial Office, the Wellcome Foundation have made Mr. S. L. Hignett, B.Sc., M.R.C.V.S., free to visit Antigua in the Leeward Islands to investigate a bovine infertility problem which, we understand, rather threatens a special cattle breeding programme on that island. Mr. Hignett left Britain on Friday, February 2nd by air and expects to be back at the Wellcome Veterinary Research Station early in March. Meantime, we are informed, the assistance that Station gives to veterinary surgeons will be available through his brother, Mr. P. G. Hignett, M.R.C.V.S.

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R.C.V.S. OBITUARY

Simpson, George Howarth, 13, Mowbray Place, Sowerby, Thirsk, Yorks. Graduated N. Edinburgh April 20th, 1885. Died September 23rd, 1948; aged 86 years. (Notification just received.)

Matson, Thomas, D.S.O., M.B., CH.B. (EDIN.), B.V.SC. (MELB.), D.V.S.M., Lt.-Colonel late R.A.V.C., Binney Street, Euroa, Victoria, Australia, late of 10, Albany Street, Edinburgh. Graduated Edinburgh, December 18th, 1919. Died at Melbourne, December 21st, 1950.

Dr. Thomas Matson qualified at the "Dick" College after the first world war and then went on to take medicine. Later he gave up his practice in Edinburgh and returned to Australia.

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RESTORATION TO R.C.V.S. REGISTER

We are informed by Mr. W. G. R. Oates, as Registrar under the Veterinary Surgeons Acts, 1881 to 1948, that the name of Major Richard Tookey Smith, The Cavalry Club, 127, Piccadilly, London, W.1, was restored to the Register of Veterinary Surgeons on January 31st, 1951.

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Experiments to prevent blowflies breeding in slaughterhouses have been successfully carried out in southern England by the Department of Scientific and Industrial Research.

AREA ERADICATION PLAN FOR TUBERCULOSIS

The First Attested Areas

The Minister of Agriculture and Fisheries has made local Orders declaring as tuberculosis attested areas, with effect from February 1st, the county of Zetland, the Isles of Scilly, and the islands of Arran and Great and Little Cumbrae in the county of Bute. All herds of cattle in these three areas are already attested.

These three areas now become subject to the provisions of the Tuberculosis (Area Eradication) Order, 1950 (Statutory Instruments 1950 No. 2006). That Order provides that no bovine animal shall be moved into an attested area except under the authority of a licence issued by a veterinary inspector or other officer of the Ministry or of a permit issued under the Tuberculosis (Attested Herds) Scheme, 1950; and contains other provisions designed to prevent the introduction or spread of tuberculosis.

The Orders are entitled the Tuberculosis (Zetland Attested Area) Order, 1951, the Tuberculosis (Isles of Scilly Attested Area) Order, 1951, and the Tuberculosis (Bute No. 1 Attested Area) Order, 1951. Copies of the Orders (Statutory Instruments 1951 Nos. 134, 135 and 136, respectively) may be purchased directly, price 2d. each, from H.M. Stationery Office at the following addresses: York House, Kingsway, London, W.C.2; 429, Oxford Street, London, W.1; 13a, Castle Street, Edinburgh, 2; 39, King Street, Manchester, 2; 2, Edmund Street, Birmingham, 3; 1, St. Andrew's Crescent, Cardiff, and Tower Lane, Bristol, 1; or by post (3d.) from P.O. Box No. 569, London, S.E.1.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Ayrshire.—T. D. Dickson, Spring Gardens, by Ayr (Feb. 4th).

Lanarks.—2 Holding, Easter-Queenlie, Shettleston (Jan. 30th); Quarry Cottage, Dykehead, Shoots (Feb. 1st).

Lancs.—Mitton Hall Farm, Mitton, Whalley (Feb. 2nd).

Norfolk.—White House Farm, Cawston, Norwich (Jan. 31st).

Notts.—Woodlands, Old Bilsthorpe (disease at Eaking Road Piggeries, Bilsthorpe) (Jan. 30th).

Suffolk (*E.*)—The Grange, Little Wenham, Colchester, Essex; White Wheat Farm, Baylham, Needham Market (Feb. 1st).

Yorks (*N.R.*).—Whitby Avenue Allotments, Stockton (Feb. 1st).

Yorks (*W.R.*).—Cook Street, Bentley (Feb. 1st); Cliffe Cottage, Dick Lane, Thornbury; Market Green, Skelmanthorpe, Huddersfield; Mogra Farm, Swinefleet, Goole (Feb. 2nd).

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THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

At the annual meeting of the Parliamentary and Scientific Committee, held last week, the following new officers were elected: Vice-Presidents, Lord Haden-Guest, Sir Wavell Wakefield, M.P., and Sir Henry Tizard; and joint deputy Chairman, Mr. W. T. Wells, M.P. The following officers were among those re-elected: President, Lord Samuel; Chairman, Mr. M. Philips Price, M.P.; Vice-Chairman, Sir Charles Goodeve; joint deputy Chairmen, Mr. F. J. Erroll, M.P., and Mr. Raymond Blackburn, M.P.; and joint Honorary Secretaries, Mr. C. Orr-Ewing, M.P., and Dr. W. R. Wooldridge.

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BURNS' SUPPER AT LASSWADE

On Thursday, January 25th, a gathering of about 50 comprising the staff of the Veterinary Laboratory of the Ministry of Agriculture and Fisheries at Lasswade and friends, celebrated the anniversary of the poet's death by attending a Burns' Supper at Eskgrove. This annual function at the laboratory has become something of an institution and the guests included the Director, Dr. Stableforth, and Mr. J. A. Aldridge from Weybridge, Capt. N. Bisset, Mr. J. N. Ritchie, Mr. H. E. Harbour, Dr. Greenwood, Director of the Poultry Research Centre, Edinburgh, Professor Robertson and Mr. R. Hood, of the Royal (Dick) Veterinary College, and several members of the Ministry of Works, including Mr. Kirk, Senior Architect, Messrs. McMyn and Wilson, District Surveyors, Mr. Geary, District Engineer, and Mr. Dalrymple, Superintendent of Works. Professor Dalling was prevented from attending by urgent business in London and Dr. Russell Greig and Professor Boddie through indisposition. The haggis was "piped in" in traditional fashion by Pipe-Major Crombie, of the Royal Scots, and addressed by Mr. J. E. Wilson, who presided. The "Immortal Memory" was proposed by Capt. Bisset and Mr. Ritchie toasted "The Lasses." Thereafter, the company was entertained to a programme of Scots songs and dances by the laboratory choir and team of country dancers, and other artistes.

R.C.V.S. CENTRAL LIBRARY FOR ANIMAL DISEASES

Accessions for the Quarter Ending December 30th, 1950

Books

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Hayes, M. Veterinary notes for horse owners. A manual of horse medicine and surgery. *Fourteenth edition,* revised by J. F. D. Tutt. Hurst & Blackett Ltd., 1950.

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Miller, M. E. Guide to the dissection of the dog. *Second edition,* revised and reprinted. Ithaca (Edwards Bros.), 1949.

National Federation of Young Farmers' Clubs. Dictionary of agricultural terms, English-French, French-English. London: National Federation of Young Farmers' Clubs, 1950. (For reference only.)

Nieberle, K., and Cohrs, P. Lehrbuch der speziellen pathologischen Anatomie der Haustiere. *Third edition.* Jena: Gustav Fischer, 1949.

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Reports 64.

Pamphlets and Reprints 282.

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LEGAL NOTES

Horses' Deaths After Road Journey.—At Retford recently two lorry drivers, Arthur Thomas Shields, 35, of Harlow Road, Rainham, Essex, and Horace Oldfield, 29, of Bridgeland Road, E., were each fined £15 and £7 0s. 9d. costs for causing unnecessary suffering to horses. A similar summons against Robert John Stevenson, 27, a driver's mate, of Dundee Road, Plaistow, E., was dismissed.

Mr. Gordon Jones, for the R.S.P.C.A., said (reports *The Times*) a firm of horse slaughterers at Bentley, near Doncaster, wanted to move some horses to London. Five were loaded into a lorry driven by Shields, six into a lorry driven by Oldfield, for whom Stevenson acted as mate, and four into a trailer. The next morning Mr. T. V. Shanks, M.R.C.V.S., a Retford veterinary surgeon, passing by East Markham, noticed the lorries drawn up and that a grey horse was lying on the ground near one lorry. This horse could not rise, and was in a distressed and injured condition; later it died. A brown horse was also found lying down and unable to rise. It was in a deplorable state and was subsequently shot. One lorry contained six horses—four were standing at the front end and two were down at the rear. These two horses had to be dragged out by ropes and one was found to be injured, and appeared to be dying. Mr. Shanks decided the only humane thing to do was to have it shot. The area of the floor space of one lorry was 81 square feet, and the other just under 122 square feet, while that of the trailer was 80 square feet.

For the defence it was stated that there was nothing done by Stevenson to cause the horses suffering, and that Oldfield and Shields had merely done the job they were told to do by their employer.

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AMENDMENTS TO THE POISONS RULES

Further to a previous announcement, the *Pharmaceutical Journal*, in its issue of December 23rd, observes that certain changes in the Poisons Rules and additions to the Poisons List are proposed and Statutory Instruments giving effect to these proposals are being prepared. "One proposed amendment recognises the fact that procaine penicillin, being subject to the restrictions of the Penicillin Act, 1947, can well be exempted from the restrictions applied to substances included in the First Schedule to the Poisons Rules. This change will not affect pharmacists to any great extent as the preparation is only supplied to the public on prescription. On the other hand, there will be no need for sales to medical practitioners and institutions to go through the Poisons Register, and it is in this respect that the amendment will eliminate formalities which manufacturers, in particular, have found cumbersome. No loss of safeguards is involved since the relaxation affects procaine only when in combination with substances covered by the Penicillin Act.

"*p*-Tertiary amyl phenol, which has come into use commercially as one of the higher phenolic antiseptics of low toxicity, is in a similar category to tertiary butyl cresol, which is already exempted from the requirements of the Act and Rules. The exemption of the amyl compound is, therefore, proposed. The Fifth Schedule to the Rules sets out the form in which certain substances may be sold by listed sellers of Part II poisons. One of these substances, organic compounds of mercury, may thus be sold in the form of agricultural and horticultural insecticides, and seed and bulb dressings. An amendment now introduces an exception to this class, for it is intended that with organic compounds of mercury containing a methyl group linked with the mercury atom, the substance may not be sold by a listed seller. The background to this change in the Fifth Schedule is of interest. It appears that a methyl mercury compound has come on to the market in Sweden as a seed dressing and although it has not yet been imported into Britain, its toxicity is such that it is thought necessary to apply a greater degree of restriction to its sale than could be achieved through listed sellers. The sale of methyl mercury derivatives is, therefore, to be confined to authorised sellers of poisons.

"When the antihistamine compounds were added to the Poisons List in September last, there was some conflict of technical opinion as to whether the definition "Tetra substituted N derivatives of ethylenediamine or propylenediamine" covered the substances chlorcyclizine (Di-paralene, Histantin) or promethazine (Phenergan, Avomine). It is evident that these two substances were intended to be included and the position has now been clarified. As substances are added to the Poisons List this is being done under names which have been approved by the British Pharmacopoeia Commission. Gallamine (Flaxedil) is one example, and Paradione is also to be included under an official name which has yet to be approved. Both of these substances will also be added to the First and Fourth Schedules and come into the 'prescription only' class."

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Hobbles Available as Surplus Government Veterinary Stores.—Twelve sets of repairable leather hobbles, without fittings, have now been declared surplus Government veterinary stores, and purchase enquiries should be addressed to the Army Veterinary and Remount Services Directorate, The War Office, Worcester Road, Droitwich.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

EQUINE CASTRATION

Sir,—I was very interested in the article by Professor Formston and heartily agree with all he says regarding the castration of foals. Unfortunately, my experience is very limited but it has convinced me that young geldings are less trouble, thrive better, make better growth and continue growing until a later age than young entires and that the earlier the operation is over the better from every point of view.

At different times before the war I owned nine colts (six thoroughbred and three nearly so): these were all castrated as foals and grew into big good looking horses capable of carrying 14 stone to hounds—one became a useful steeplechaser, another won eight point-to-points and was second in a ninth.

In 1931 I bought for a few pounds a frail undersized thoroughbred foal ready to wean; he had already been castrated. At four years this colt was 16 hands. At six years he was 16·2, very good looking and an exceptional hunter: I refused many offers from £400 to £1,200 for him.

In 1940 I bred two colt foals, one from a hunter mare, the other thoroughbred. As I was in the Middle East when they were born I wrote home and asked a friend to give me his opinion and to castrate them as soon as possible. He replied very promptly and said the hunter mare had a particularly nice foal—one of the best he had seen for a long time—but the thoroughbred foal was a miserable little specimen. He was able to operate only on the latter as the hunter foal had an undescended testicle. Eighteen months later I saw these colts for the first time; the thoroughbred was then a really nice yearling (he has since won prizes as a middleweight hunter) but the other was most disappointing and as I could see no future for it I destroyed it. I was able to see these colts develop from day to day and ride and hunt them in later years and they certainly showed no ill effects from early castration.

In my opinion Professor Formston has given a valuable lead to the younger generation of veterinary surgeons and I strongly advise them to follow it.

Yours faithfully,

B. R. BODY.

Mortimer,
Berks.
January 31st, 1951.

Sir,—I was very interested in the article on castration of foals by Professor Formston and the differing views of Professor Forsyth. I should like to bring forward a further point of view.

I have always understood, from the old school of veterinary surgeons experienced in horse practice, that the increased danger of bowel descent through the inguinal canal was a main reason why the operation generally was not performed on foals (a risk which is not entirely eliminated in yearlings). The high proportion of newly born foals which show varying stages of scrotal hernia—in my experience in Shires at any rate—leads me to support this view.

With few exceptions these hernias have disappeared completely, without any form of treatment, by the time the animals have reached the yearling stage and cause no more difficulty.

When requested to castrate a blood foal, I did it by the standing method, using small clams. This appears satisfactory for a normal foal, but without strong assurance to the contrary I should be

extremely reluctant to make foal castration a general practice.

It is possible that Professor Formston's method of suturing is designed to avoid the disaster mentioned.

Yours faithfully,

Acle, Norfolk. O. V. Gunning.
February 3rd, 1951.

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"FOUL IN THE FOOT"

Sir,—It it not regrettable that this unscientific term continues in use? It is one of a number of old or even mediaeval terms denoting animal diseases, which no doubt cause cultured people to continue to look down on the veterinary profession as a lot of cow-doctors and horse-leeches. The offending term suggests that we know that there is something amiss with the foot, but do not know what, so just clap on a "foul" and leave it at that.

Our teachers are presumably the people who should look after technical nomenclature, but there is no sign that they are making any reforms. With regard to "foul in the foot" one quite sees that this condition of varied pathology needs some general name for ordinary use, but even so there appears to be room for much improvement. "Foot rot" of the Americans is better, though this also leaves something to be desired.

There are many other old offending terms still in use, hence plenty of scope for reform, but the one I have picked on is undeniably the most foul!

Yours faithfully,

Alderley Edge, J. Tweedale Edwards.
January 30th, 1951.

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STATE CONTROL OF MASTITIS

Sir,—In *The Veterinary Record*, December 9th, 1950, you publish a letter from Messrs. E. P. Barratt and H. A. Crawshaw, Guildford, relating to the Veterinary Investigation Department advising on mastitis. They have a correct insight regarding the proposed research into mastitis. As they say, research has ended and routine treatment is a corollary. The Ministry persuaded veterinary surgeons in the Home Counties to co-operate in stabilising a treatment for the majority of cases of mastitis. In this practice we offered two such herds. All "treatment," sterilising buildings, sampling, etc., was done by full-time staff. We were allowed once to transport the penicillin to the farm; in this case we have since dispensed more penicillin (since blitz treatment ceased) than before the treatment; hygiene and general care are excellent.

A third herd owner, hearing of one of the others, asked for such attention. We could not refuse, and the Veterinary Investigation Officer came along and did the sampling, etc.; here again we were allowed to transport the penicillin. In 14 days from the initial penicillin injections we had a message from the farmer that five heifers, which as herd members had had penicillin treatment, had acute mastitis (in our part of the country, mastitis in a heifer is an extremely rare condition); the Veterinary Investigation Department were informed but were not interested. It turned out to be of the acute staphylococcal type and it was only with constant stripping, sulphamezathine and sulphanilamide (not supplied by the State) that these animals' lives were saved.

When will our experts realise that the streptococcus is an essential symbiotic *normal* inhabitant of the cow's udder, in the same way that the same organism exists in our throats and usually protects us from pneumonia?

Messrs. Barrett and Crawshaw mentioned the co-operation of the laboratory staff, but they should remember that co-operation to-day may be direction to-morrow.

In *The Veterinary Record*, December 23rd, 1950, a letter on the same subject is written by Messrs. T. Williamson and P. Robinson, of Newport, Shropshire: "the owner is not aware that his herd is under consideration." This is tyranny with a vengeance, the person most interested is the last to be consulted.

The writers of the above letters implicate the phenomenal increase in milk yield: then why is it necessary to subsidise the treatment? The production of milk is purely an economic matter. I do not appreciate why coal-miners in Yorkshire should be taxed to supply penicillin to farmers in Surrey, nor why farmers in Berkshire should be taxed to equip new bathrooms in the coalmines in Yorkshire. Every bucket stands on its own bottom.

If the penicillin treatment is such a resounding success, farmers should and would be willing to pay for it (I know the farmers' side pretty well, my father and two brothers are fee-paying clients of this practice).

The "free" bogey is worn out. Since 1941, when all farmers were Schedule "D" they have not been unaware from where the financial element in "free" treatment is derived.

I would respectfully request the writers of these letters to read, reread and then read again the address in the Supplement, *Veterinary Record*, December 9th, 1950, by the President of the Eastern Counties Veterinary Society. I wish I had the versatility of his articulation.

I agree with him (the President of the Eastern Counties Division) entirely, except the remark about the Animal Health Trust. To me Animal Health Trust and Animal Health Division have an ominously similar sound.

Yours faithfully,

66, Coningsby Road, L. Pitcher.
High Wycombe,
Bucks.
January 24th, 1951.

[At the request of the Veterinary State Medicine Committee Dr. Stableforth discussed the control of mastitis with the immediate Past-President, N.V.M.A., on August 3rd last year. It was then made clear:—

(1) It is the view of the Ministry that there is need for survey tests to determine the true incidence of *Str. agalactiae* and other infections, and they have developed a technique which, almost for the first time, makes this particular survey a practical proposition. Therefore, they want to go forward with these survey tests. These are not intended to cover more than 10 per cent. of herds in a given county and the herds must of necessity be selected on a randomised basis.

(2) They are not satisfied that the schemes of dosage, or best methods of applying penicillin with a view to the control or eradication of agalactiae mastitis, have yet been determined. In these circumstances, they think further tests, especially of the methods of application, are necessary.

(3) They further believe that the control of agalactiae mastitis by the use of penicillin has not yet been put into operation in this country to the extent which it should and that, in these circumstances, one of the best methods of increasing the extent of control measures for agalactiae mastitis is by the type of scheme proposed for the Reading area.

(4) So far as the control of the use of penicillin is concerned, the intention is that each herd brought into the scheme receives free penicillin only for the initial treatment and any further treatments which are necessary during the first year of the observation.

(5) In the survey the samples are taken by the farmer and forwarded direct to the Ministry's laboratory, who, having made their examination, report to the veterinary surgeon and send a copy to the farmer accompanied by a letter advising him to call his veterinary surgeon for advice on keeping the herd free from *Str. agalactiae*, treatment if needed, and control of all other forms of mastitis. Any invitation to co-operate in a trial on treatment and control is offered by or through the owners' veterinary surgeon; milk samples are taken by the farmer and sent to the laboratories, who then report back to the veterinary surgeon, with a copy to the owner.

(6) The penicillin is supplied as a bulk supply free to the veterinary surgeon who uses it, or issues it to the farmer in accordance with the scheme. After the initial treatment, further supplies of penicillin are made to the veterinary surgeon free of charge, to enable him to keep a small stock for the purpose of treating cases as they arise. Although the farmer knows that the penicillin is supplied free of charge, it is made clear to him that he is responsible for the veterinary fees involved in advice as to eradication of *Str. agalactiae*, control of other mastitis and in treatment of the herd and of individual cases of all kinds.—*Editor*.]

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ELECTROCUTION OF UNWANTED DOGS AND CATS

Sir,—In *The Veterinary Record* of December 23rd (Vol. **62**. No 51) there is an article by Major C. W. Hume on euthanasia of dogs and cats by electrocution; we are indebted to Major Hume for indicating the gaps in our scientific knowledge of a method widely employed because we believe it to be speedy and humane.

Many years ago, my teacher, Professor D. J. Kok, was interested in this subject and after his death there came into my hands some of his experimental results on animal electrocution. His experiments were made with mains alternating current of different voltages, the highest being 220 volts. One electrode was the metal collar and the other the wet floor. The resistance of the animal was found by passing through it current, measured on a milliammeter, from an 8-volt accumulator; the resistance can then be calculated from Ohm's Law (resistance = voltage/current). The voltage drop was assumed to be that of the accumulator on open circuit. The current in active electrocution was measured with a milliammeter and the voltage taken as that of the alternating current applied.

Dogs

Kg.	Ohm.	Volt.	M.A.	Death	
48	1333	220	165	Direct	Hair cut and wet.
12½	8888	80		,,	Iron tube in anus and mouth.
5½	800	100		,,	Hair wet.
30	1222	220		,,	,,
5½	1222	80		,,	,,
26	2800	220		,,	,,
5¼	2800	220		,,	,,
22	1222	220		,,	,,
11	2800	220		,,	,,
9	800	150	32.5	,,	dry
24	2000	220		,,	wet
20	4000	220	42	,,	,,
12½	high	220	50	,,	dry
31	3200	220		,,	wet
6½	2666	110	36	,,	,,
5	high	220		,,	,,
9	,,	220	55	after 17 sec.	dry
8½	,,	60		after ½ min.	,,
20½	,,	50	44	after ⅓ min.	,,
6½	5700	20	22	,,	,,

Cats

Twenty-two cats were killed with 120 volts but some cried out and all showed erection of the hairs of the tail. If the skin was wet their resistance was 1,600, 2,000 and 2,000 ohms; with a dry skin resistances of 5,333, 4,000 and 5,333 ohms were obtained.

Professor Kok's conclusions are that there are variations in the individual in resistance, but an alternating current of 220 volts is more than enough for rapid electrocution, *particularly if the skin is wet*. The resistance of the body is about 500 ohms but the skin and hairs make it highly variable.

In one dog and one cat, with the thorax opened under narcosis, fibrillation of the auricles was seen first and then of the ventricles. In the dog death ensued but the cat recovered. In the cat, during 20 minutes after death by electrocution, I have seen currents registered by an electroencephalogram indicating that there is no damage to the central nervous system. It does not seem necessary, therefore, that current should flow through the head. Major Hume cited electrocution through the head as being used in Holland; but nowadays one electrode is applied to the lip or ear and the other to the flank.

We hope to obtain more data on euthanasia by electrocution as it appears to be a good and economical method.

Yours faithfully,

Pieter Bothlaan 18, Amersfoot, Holland. E. J. Voute.

January 17th, 1951.

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THE JAMMED SYRINGE

Sir,—While it is generally recognised that jammed syringes are not to be found in properly run establishments, the following method of releasing the plungers may be of interest to fellow sinners. It is applicable to all sizes of syringe except the smallest and has the advantage of being most effective with the larger sizes.

A 1 c.c. syringe is set up with a short needle and any small convenient piece of rubber is pierced by the needle to act as a washer. After filling the small syringe with water the needle is inserted into the nozzle of the jammed syringe, and holding the two firmly together the contents of the smaller one are injected forcibly into the larger. It will generally be found that after one or two attempts the piston in the larger syringe will be moved.

Since the surface area of a 10 c.c. plunger is approximately six times that of the 1 c.c. size, the pressure generated inside the larger barrel will be unusually high. Where the piston is jammed in mid barrel, therefore, it is probably advisable to whip or bind the barrel first with string to minimise the danger of cracking it.

Yours faithfully,

The Office of the Chief Veterinary Officer, Nicosia, Cyprus. R. W. Crowther.

January 27th, 1951.

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PARTICIPATION OF VETERINARY SURGEONS IN EXPERIMENTS ON ANIMALS

Sir,—As the fate feared for the proposals put forward *re* the above has overtaken them (supplement to *The Veterinary Record*, January 20th, 1951, page 6), may I be allowed a brief comment before they pass to the oblivion to which they have been consigned.

Rightly or wrongly, the verdict and the reasons given for reaching it have destroyed for me faith in the sincerity of the assurances given of the intention of the Association to support the widening of the scope of activity of the profession and appear to underline once more the policy of concentration on the treatment and control of animal disease for financial gain.

If the non-veterinarian is skilled enough to carry out experiments on farm animals without our collaboration it would seem that the monopoly given us by the Veterinary Surgeons Act, 1948, was poorly justified.

Much misunderstanding and lots of correspondence would be saved if the Council, N.V.M.A., were to issue a statement on the aims of the Association or even gave some indication of what activities it believed to be in the interests of the profession.

Yours faithfully,

The North of Scotland College of Agriculture, Veterinary Department, Marischal College, Aberdeen. John C. Grant.

January 23rd, 1951.

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R.C.V.S. COUNCIL MEETING IN DUBLIN

Sir,—I heartily endorse the comments of Dr. J. McCunn in this matter. There appears to be a diminishing amount of publicity during recent years of the doings of our Council, some of which have involved major decisions on which I feel the profession should have been previously informed and consulted.

The editorial comment about being unable to obtain a shorthand reporter is too fantastic to be taken seriously.

Yours faithfully,

77, Kennings Way, Kennington Cross, London, S.E.11. H. C. P. King.

January 27th, 1951.

[Nevertheless, it is the fact that arrangements which both we and the Royal College had every reason to believe were "hard and fast," broke down at the last minute.—*Editor.*]

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
Dec. 16th to 31st, 1950	13	—	39	—	—	54
Corresponding period in—						
1949	20	—	8	—	4	—
1948	8	3	8	—	5	—
1947	6	1	48	—	17	3
Jan. 1st to Dec 31st, 1950	344	20	172	—	26	430
Corresponding period in—						
1949	244	15	582	—	46	5
1948	118	15	267	1	69	27
1947	121	104	2,222	1	103	37

NOTE.—The figures for the current year are approximate only.

* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at December 31st, 1950, was as follows:—

England	Wales	Scotland	Total (Great Britain)
25 814	15,543	13,688	55,045

Advertiser's Announcement

Cessation of Small-animal Carcases Disposal Service

Bird's Chemical Works, Duxford, nr. Cambridge, regret that owing to circumstances outside their control they have to announce the closure of their service to the veterinary profession in the disposal of small-animal carcases.